FLIGHT
and
The AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

8-10, CORPORATION ST., COVENTRY. Telegrams: Autocar, Coventry. Telephone: Coventry 5210.
GUILDHALL BUILDINGS, NAVIGATION ST., BIRMINGHAM, 2. Telegrams: Autopress, Birmingham. Telephone: Midland 2971 (5 lines).
260, DEANSGATE, MANCHESTER, 3. Telegrams: Iliffe, Manchester. Telephone: Blackfriars 4412.
26B, RENFIELD ST., GLASGOW, C.2. Telegrams: Iliffe, Glasgow. Telephone: Central 4857.

SUBSCRIPTION RATES: Home and Abroad: Year, £1 8 0. 6 months, £1 4 0. 3 months, 12s. 0d.
Registered at the G.P.O. as a Newspaper.

No. 1673. Vol. XXXIX. JANUARY 16th, 1941 Thursdays, Price 9d.

The Outlook

Towards the Stratosphere

OWING to the time lag which always exists between the conception of a new type of aircraft and its introduction into service, it is very necessary for designers to look ahead and to visualise what is likely to be the "next step." This process is difficult enough in all conscience when commercial aircraft are contemplated. In the case of military types the designer's difficulties are multiplied many times by factors over which he has no control. He is already sufficiently occupied with purely technical questions, and when to these are added the uncertainties of operational policy he may well be excused for guessing wrongly now and then, particularly when one bears in mind that there is a very good chance that changes will take place in operational policy between the time a specification is issued and the time when the machine is about to go into service. Such cases are not unknown!

We on *Flight* have long held the view that one "next step" will be in the direction of greater operational altitude, and we have felt it our duty to warn the country of the danger that Germany may now be preparing new types of aircraft capable of flying over this country at altitudes which cannot be reached by our anti-aircraft guns or by our existing fighters. The prospect is not a cheerful one, but the possibility is there, and it is necessary for us to be on our guard.

Not so very long before the outbreak of war an eminent German scientist lectured before the Royal Aeronautical Society and told of some of the results which German research had obtained at the D.V.L. Among them were some rather alarming data concerning supercharging, a subject which is very closely allied to that of sub-stratosphere flying. At the time *Flight* said that we ought to be ashamed of ourselves if it was indeed a fact that we had let Germany get ahead of us in the matter of supercharging, in view of the long lead which we had at one time established in this particular field. It is not to be assumed that Dr. Seewald was permitted to give results achieved, nor even to divulge the nature of, the very latest researches, and it would be safer to take it for granted that much progress has been made in the meantime.

Fundamental Problems

AS we feel that sooner or later this country will be faced with the problem of dealing with high-flying German aeroplanes, we have thought it of interest to examine the fundamental problems involved, and in this issue we publish an article by Mr. W. O. Manning in which he outlines the broad principles of the subject. The author has made the article as elementary as possible, so that even non-technical readers should be able to follow his arguments.

Certain general conclusions emerge. There are, for instance, no special difficulties in the design of the aircraft itself. The wing loading and power loading have been kept low for obvious reasons, and in external form the aircraft can be quite orthodox. The main problems relate to supercharging the engine and the cabin. In this connection it may be remembered that before the war at least three British firms were engaged on high-altitude work. The Fairey and Short companies had orders for actual machines, and General Aircraft were doing a good deal of private research. The war interfered with this, and the orders were shelved, but General Aircraft have found time to continue experimental work in spite of difficulties and interruptions, as shown by the pictures on page g.

We do not know whether or not the conclusions reached by Mr. Manning on purely theoretical grounds agree in all cases with the practical experience of the firms mentioned, but he does not foresee insuperable difficulties in developing three-stage superchargers,

provided the inter-stage coolers can be installed in the wing.

More likely to give trouble is the airtight cabin, especially since guns will have to be outside the cabin and operated by some form of remote control. The question of bullet holes in the cabin walls is dealt with, and simple methods suggested for patching them up. Here we would remind our readers, and Mr. Manning, that American research seemed to indicate that the effect on the crew of a hole in the cabin, in other words a reduction in pressure, was not nearly so distressing as an increase in pressure at the same rate. Presumably, therefore, a puncture need not necessarily have serious consequences.

Ultimate Speed

THERE is one section in Mr. Manning's article which may, perhaps, puzzle some readers. He points out that greater speed is obtainable at ground level than at great altitudes, whereas most people are under the impression that greater speeds are possible in "thin" air. Both views are, of course, correct. The explanation is that if one is aiming at the greatest possible speed, the limit is set by the speed of sound, which in turn is governed by temperature and not by density. Actually, it seems possible that ground level will not be the best height for maximum speed, but some height, not very great, at which there exists the best compromise between temperature and density. However, that is by the way.

On the other hand, if one is thinking in terms of any given aeroplane, and the power of the engine can be maintained by supercharging and the airscrew efficiency kept up, then greater speed is obtainable at altitude than at low levels. That, briefly, is the explanation of Mr. Manning's apparent paradox.

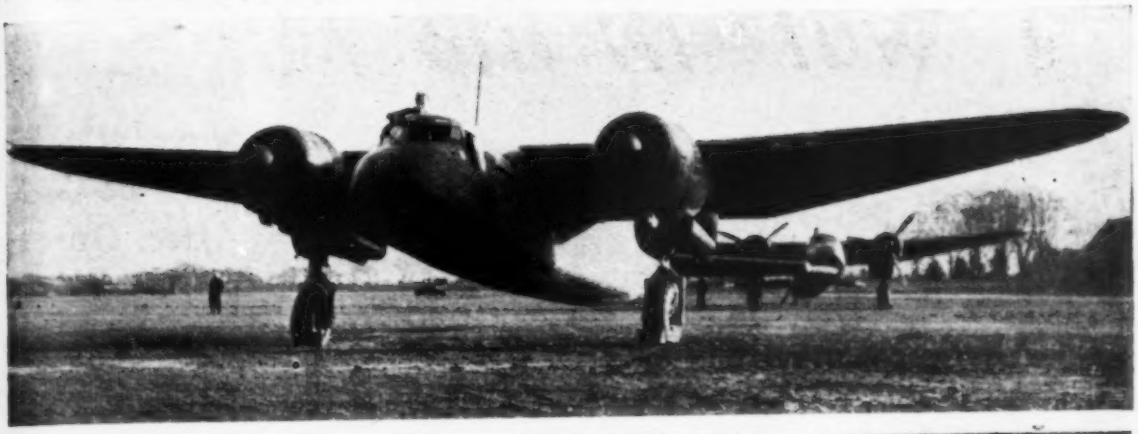
A.D.C.C. to A.T.C.

WHEN Air Commodore Chamier, as Secretary-General of the Air League of the British Empire, launched his Air Defence Cadet Corps scheme he could hardly have foreseen that it was destined one day to become one of the greatest things that have ever happened in connection with the Royal Air Force. That he foresaw a rapid growth of the A.D.C.C. one may take for granted, and in that he was not disappointed, for by the time the Air Ministry decided to take over the Corps it numbered probably 20,000 boys up and down the country. We feel that the Air League of the British Empire in general, and Air-Commodore Chamier in particular, deserve the thanks of the nation for having had the foresight and courage which have now borne such excellent fruit. For let it not be forgotten that the Air League itself has had little encouragement and assistance. Even in connection with the A.D.C.C. scheme, the Air Ministry made a per capita grant of 3s. 6d. per boy, and but for the support given locally by municipalities and private citizens, the Air League might well have found itself in an embarrassing position. Now one feels that if the Air League of the British Empire had never done anything else than launch the Air Defence Cadet Scheme, it would have justified its existence.

The effects of the new scheme, whereby the A.D.C.C. is taken over by the Air Ministry and converted into the Air Training Corps, are incalculable. That they will be very great goes without saying. That the Royal Air Force will benefit vastly is certain, for the enthusiasm and aptitude of the Cadets have been amply demonstrated, and there is no reason to expect a deterioration under the new title. On the contrary, it is likely that the higher status now conferred upon the Corps will act as a spur to fresh endeavours.

A NIGHT FIGHTER BY DAY. Between them the two occupants of the Boulton Paul Defiant can survey the entire upper hemisphere and most of the lower

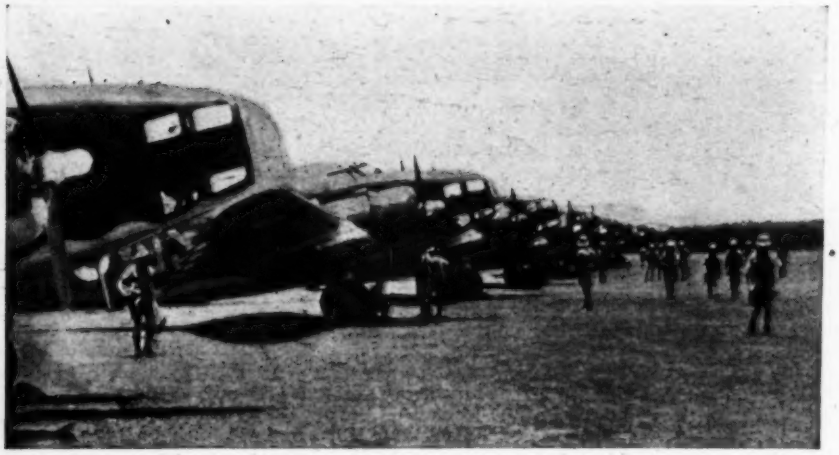
BOTH A G.R. & T.B. TYPE



COASTAL COMMAND ACQUISITION : The Blackburn Botha, which is already in service as a general reconnaissance and torpedo bomber. It is powered with two 900 h.p. sleeve-valve Bristol Perseus engines. Span is 59ft. ; length, 50ft. 11½in. ; and height, 18ft. 3in. Points of interest are the streamline power-operated twin gun turret amidships, external bomb racks under wings, twin landing lights in the port leading edge, and the backward-retracting undercarriage.

War in the Air

Naval Dockyards Bombed After Quiet Spell



PACIFIC INTENTIONS : Lockheed Hudsons of the Royal Australian Air Force at Singapore.

A FEATURE of the week under review has been three consecutive nights during which no enemy aircraft flew over England between black-out and dawn. The R.A.F. were also held up for the first two nights, but raided Wilhelmshaven, Emden and Borkum on the third night. The rest was caused mostly by wintry weather giving conditions of ice formation and low visibility.

In the Middle East Command our bombers have now transferred their attentions to depots further west along the N. African coast. Bardia having fallen, the British Forces have lost no time in attacking the port of Tobruk, which lies some 60 miles along the coast road.

The help lent to the Greeks fighting in Albania continued as usual despite the very bad weather conditions met with in the Albanian mountains.

A chronological account of the week's events starts with daylight and night attacks by aircraft of the Coastal and Bomber Commands on the port of Brest, on Jan. 4th. Blenheims were used for the daylight part of the proceedings, and of the force carrying out the attack one failed to return.

Conditions and visibility were extremely poor, but several sticks of bombs fell directly on the target areas. A destroyer was hit three times by one Blenheim, and the bomb bursts were followed by explosions. In a later attack, at least one bomb exploded on the stern. The destroyer had been using its full anti-aircraft armament against the bombers, but before the raid ended the warship was shrouded in smoke and its guns were silent. The enemy used a force of fighters in an unsuccessful attempt to resist the attack; one of our aircraft was confronted by twelve Messerschmitt 109s but it evaded them and went on to its target. After two Messerschmitt 109s had repeatedly tried to drive off another aircraft, one of the enemy broke up in the air from the counter fire.

Targets in Hamburg were also raided. On the same day Hudsons of the Coastal Command successfully attacked two German supply ships off the Norwegian coast.

Both vessels were found close in shore, at Lister and Obrestad—so near the land that the German coastal batteries were firing at the low-flying Hudsons from less than four hundred yards, but neither aircraft was damaged. Six bombs burst on the deck of the larger ship and at least three and probably five on the smaller.

The pilots approached at very low altitude and then climbed steeply to make dive attacks. A wide tower of dense smoke rose two hundred feet high after heavy explosions from the larger ship.

While the R.A.F. were thus scoring at least one destroyer and two supply ships, the *Luftwaffe* contented itself with single machines dropping bombs in East Anglia. During the hours of darkness the Germans attempted to start up another fire raid, but the incendiary bombs which were dropped were handled with the utmost dispatch and no serious fires resulted. The evening of the 5th saw the dusk attack on Brest repeated by the Coastal Command Blenheims.

The raid was carried out in spite of great difficulties. Weather was bad and icing conditions were met on the journey over the sea. Enemy fighters were circling over Brest when the Blenheims arrived, but they could not stop the attack. The Blenheims drove them off, and then did their bombing. Many hits were scored on the docks.

One aircraft was attacked by a Messerschmitt 109, but the rear-gunner waited until the range closed to 100 yards. Then he fired a pan of ammunition into the German fighter, which turned over and plunged down with smoke coming from its engine. The enemy ground defences put up an immense barrage. A Blenheim was rocketed, and almost turned over by the blast from an anti-aircraft shell bursting directly underneath it, but all our aircraft returned safely.

For the next three days and nights the Germans contented themselves with raids by single aircraft during daylight hours. These were mostly directed against eastern and south-eastern towns, but a few succeeded in reaching the Midlands and Liverpool. As already stated, the R.A.F. were also grounded for two nights but during the 6th our Blenheims were busy again. Those of the Coastal Command attacked supply ships off the Norwegian coast and those of the Bomber Command scored a direct hit on the bow of an enemy tanker near Holland.

After Bardia

MONDAY'S (January 6th) communique from the Middle East spoke of increased activity by the Italian Air Force over eastern Libya. The usual result ensued. Seven Fiat CR42s and four Savoia-Marchette S79s were destroyed and some others damaged. Bombing activity throughout the previous day and night had been directed against Tobruk, which now becomes Gen. Wavell's next target. Numerous raids were made, during which many tons of bombs were dropped on military buildings, aerodromes, naval barracks and town's defences. One very large fire was started and was visible from Bardia, a distance of about sixty miles. Subsequent aircraft dropped their bombs into the centre of this fire, considerably increasing its area.

A raid was also carried out on the naval base at Massawa, in Italian East Africa. Tripoli was heavily dealt with on the night of January 6th, the power station and harbour

WAR IN THE AIR (Continued)

being severely bombarded. Tobruk has been bombed almost continually, and its aerodrome—at El Adem—has been evacuated by the Italians. Our troops on taking over found no less than forty aircraft which had been rendered unserviceable by the R.A.F. attacks.

In Albania, Valona was again attacked. The raids were carried out in bad weather conditions, rain and low cloud being met near the target. Bombs were seen to burst on buildings, warehouses and in the vicinity of the harbour jetties. Enemy fighters intercepted, and one CR42 broke off the attack with smoke coming from its engine and another enemy fighter, a G50, dived towards the sea without its guns having been fired. One of our bombers failed to return.

Seven-hour Raid on Dockyard

ON the night of Wednesday, January 8, while the German Air Force were still inoperative, we attacked naval dockyards at Wilhelmshaven and Emden. The communiqué dealing with the raid stated:—

Aircraft of Bomber Command attacked the naval dockyards at Wilhelmshaven and Emden. At Wilhelmshaven many explosions were observed, and these were followed by large fires. More than 20 fires were started in the docks at Emden. Other aircraft bombed an enemy aerodrome on the island of Borkum, where barracks were hit and a fire broke out. None of our aircraft is missing.

Moonlight and clear weather enabled aircraft of the Bomber Command to identify clearly two of Germany's naval bases and shipyards in which a large number of her warships and submarines are built.

At Emden there was a box barrage of intense anti-aircraft fire, and at Wilhelmshaven guns were firing from all quarters of the town for many hours; when our aircraft were held by searchlights the barrage increased until, as one pilot put it, the sky appeared to be filled with flashes of fire as the shells burst all round his aircraft. One or two of our bombers received minor damage, but none were driven from their targets.

The raids on Wilhelmshaven began not long after 8 o'clock and the last of our pilots did not leave until just before three in the morning.

For several hours the moon shone brightly and there was no cloud or even any ground haze; as they came over the Dutch coast our pilots could see the frozen sea far below them, and the Zuyder Zee a sea of ice.

Some of our aircraft attacked the Bauhafen, a large square harbour joined by a canal to the sea; on each side of it there are slips, dry docks, and submarine and shipbuilding yards.

The great naval dockyard, the Marinewerft, is almost outside the harbour. Bombs burst all round this harbour and there were many fires, both large and small.

Emden, the importance of which as a naval base has revived in recent years, was first attacked soon after 8 o'clock and at intervals until the early hours of the morning. The skies were clear throughout this period, and visibility was exceptionally good. Docks and shipbuilding yards, and especially the Binnenhafen and the Industriehafen, were successfully raided.

The island of Borkum lies opposite Emden harbour, and some of our bombers found time to raid its aerodrome.

In the course of the night's operations aircraft of the Bomber Command also dropped bombs from a low level on enemy supply ships and anti-aircraft ships, and one came down to well below 1,000ft. to bomb a large bridge over a railway line south of Esens and to machine-gun a convoy of lorries in the same district.

Our Bombers Are Tough

IT is remarkable to think that aircraft can pass through such barrages and still return home. We are prone to think the aeroplane a fragile instrument of war, and so it is by comparison with, say, a tank. Nevertheless, it is astounding what our sturdily-built stuff will stand.

The recent case of a flare blowing out the side of a Whitley fuselage will be remembered, and there are many similar stories; of the tail and rudder of a Hampden badly damaged by cannon and machine guns; of fuselage and wings of a Whitby severely holed by anti-aircraft fire at a range of only 2,000 feet; of a Wellington hit in six places by a severe barrage; of very serious damage to the port airscrew of another Hampden. Yet once again, in the words of the official communiqué, "none of our aircraft is missing."

Over Hamburg a direct hit in the port wing of one of our Hampdens ripped open the oil tank, yet the port engine, to the pilot's astonishment, ran sweetly all the way home, a distance of over 400 miles. A Blenheim flying over Rotterdam met exceptionally heavy anti-aircraft fire. The port oil tank was punctured in three places, the lead from the starboard petrol tank was fractured, the elevator main spar was holed, the main spar and fin shot through, and a rudder cable cut half through. There were also holes in the tail and fuselage, but the machine got home and was back in service two days later.

Another Blenheim actually rose safely into the air again after hitting the sea. After this encounter with the water the airscrews were bent back, the tail wheel missing, the bomb hatch cover stove in, and the shields, cowlings and air intakes completely wrecked, yet the machine was still good for a safe if timorous journey home.

UNLUCKY FOR SOMEONE: Thirteen 18in. torpedoes awaiting installation in Coastal Command Beauforts. This view shows clearly the contra screws and control surfaces.

Benghazi and Gubba

MID-WEEK activity in the Middle East included heavy raiding of aerodromes and ports in eastern Libya, military stores at Elbasan in Albania, and air co-operation with Abyssinian patriots at Gubba.

At Martuba, our aircraft carried out low-flying attacks on 11 Savoia Marchetti S79s and several Fiat CR42s

WAR IN THE AIR (Continued)

AIR LOSSES TO JANUARY 11.

	GERMAN	BRITISH		ITALIAN	BRITISH
	Aircraft	Fighter Aircraft	Pilots	Aircraft	Aircraft
Jan. 5	—	—	—	19	2
" 6	—	—	—	1	1
" 7	1	—	—	—	—
" 8	—	—	—	9	—
" 9	2	1	1	10	—
" 10	2	—	—	5	—
" 11	1	—	—	—	—
	6	1	1	44	3
			Captured on aerodromes	75	
				119	

British bombers lost over German territory: Jan. 9, 2; Jan. 11, 2. Total 4. German losses by R.A.F. and ground defences 4,190. British aircraft lost in Northern Europe, 1 714. In the Middle East the R.A.F. have destroyed 607 Italian aircraft and have lost 79.

on the ground. Two of the S79s were set on fire and others badly damaged. Two S79s on the ground at Gazala were also attacked, one of them being severely damaged. The other was seen to be already unserviceable. At Benina, about 100 enemy aircraft on the ground were heavily bombed. Several of them were destroyed and others badly damaged. Seven S79s on the Tmimi landing-ground were seen to be burnt out.

A particularly heavy raid was made on Benghazi, during which four or five ships received direct hits and a number of fires were started in warehouses. Tobruk, of course, received continuous attention.

Enemy convoys north-west of Jarabub [about 150 miles south of Bardia] were attacked both by our bombers and fighters, and considerable damage was caused.

A successful raid was made on military stores and buildings at Elbasan, in Albania, but flying conditions were extremely bad. Snow, sleet, and rain made observation of the results of the raid difficult, but high-explosive and incendiary bombs were seen to hit several buildings and a number of fires were started.

Following a raid by our bombers on Gubba, 25 miles from the Sudan border, Abyssinians attacked the Italian garrison and captured the post. It appears that the rainy season is coming to an end, and it is to be expected that military affairs will liven up in this area.

The invasion ports have been receiving a lot of attention, and last week Brest was heavily bombed four times. A novel feature was the adoption by the R.A.F. of daylight raiding with fighter escorts. On Friday, January 10, a force of bombers escorted by over 100 fighters made an extensive sweep over the Pas de Calais. They crossed the coast at mid-day, and attacked enemy aircraft dispersed on the ground in the Forêt de Guines, near Calais, starting fires in the woods. High explosives and incendiary bombs were dropped on a railway station near, and it was left enveloped in a cloud of white smoke. No attempt at interception was made by the enemy, and on the return a section of the fighter escort carried out a low-level machine-gun attack on gun posts and enemy troops in the neighbourhood of Wissant.

Smart Fighting

A NUMBER of Henschel Army co-operation aircraft seen on the ground in a corner of Guines la Plage aerodrome were also heavily machine-gunned by the Polish pilot of a Hurricane, who flew across the aerodrome close to the ground to deliver his attack. As he climbed away he sighted two Messerschmitt 109s below him at 200ft. Singling out the nearer, he attacked it at close range, and after three bursts of fire saw it crash into the ground. Avoiding intense anti-aircraft fire from the direction of Cap Gris Nez, he then flew back across the Channel close to the sea and landed safely at his base in spite of a jammed throttle lever, which made it impossible for him to control his engine.

Four enemy patrol boats sighted off the French coast were attacked by another returning Hurricane pilot, a D.S.O. and D.F.C. Wing Commander, who came down low and sprayed the ships with machine-gun bullets. In mid-Channel a few minutes later he saw a Spitfire being attacked by a Messerschmitt 109 at about 1,000ft. and engaged it. After firing all his remaining ammunition he saw the Messerschmitt turn away with smoke pouring from it, and it was later seen by two other pilots to crash into the sea.

On the night of Saturday, January 11, the Royal Arsenal at Turin was heavily bombed by the R.A.F.

In Libya the R.A.F. have found many aerodromes deserted by the Italian Air Force. Tobruk and other places are under constant bombardment from the air. The Fleet Air Arm have raided Palermo in Sicily and damaged shipping in the harbour and warehouses beside the quays.

CIVIL AVIATION IN NEW YEAR HONOURS

THE New Year Honours List contained the names of two members of the staff of British Airways, Captain J. C. Kelly Rogers, O.B.E., and Mr. George Halliday, M.B.E., now assistant service engineer at the British Airways overseas headquarters at Durban.

Readers will remember that epic of salvage (see *Flight*, January 25, 1940) when the flying boat *Corsair* was flown out of the narrow African river Dungu at Faraje in the Sudan after being there for ten months. Badly damaged by a submerged rock in an emergency landing in March, 1939, she was refloated by the efforts of Mr. Halliday and his engineers, efforts which can only be described as full of imagination and brilliant improvisation. As well as refloating the boat, it was part of their task to superintend the construction of a dam out of local rock, timber and "antbed," the material of which anthills are composed, in order that there might be sufficient water from which the boat could take off.

After some months' work a take-off was attempted in July, but another rock ripped the bottom and the boat again sank. British Airways were about to abandon the boat, but it was the determined Mr. Halliday who pleaded for "another go at it." So the whole wearisome business was gone through again and the dam deepened to cover all possible rocks Captain Kelly Rogers was present during the last month of this work, and his presence ensured that the best possible take-off conditions were provided. With magnificent judgment he flew the boat off light from the extremely narrow and curving river, and *Corsair* was salvaged in January, 1940. Engine failure in the take-off would almost certainly have meant a bad crash.

Other important work for which Captain Kelly Rogers will be remembered was the British Airways transatlantic flights during the summer and autumn of 1940. These flights started during the height of the invasion crisis and helped very greatly to convince the American people that Britain was not only strong and confident, but that the German claims of an aerial blockade were false.

Both these men have served civil aviation well, one an Irishman and the other a Scot; one in the pilot's cockpit and the other on the ground, but both ensuring the safety of flight. Scottish marine engineers have long had a reputation for making the engines go round without stopping to talk about it, and George Halliday is typical of them.

Map of the Balkans

ONE cannot get a clear idea of what is happening in the war against Italy unless one has a good map handy. George Philip and Son Ltd. have just published one with coloured contours which extends from Pisa, Pantellaria, and Tripoli in the west to Baghdad in the east, and from Vienna in the north to Cairo in the south. The official reports spring to life when one follows them on this map, and in particular one can realise the great advantage given to the Royal Navy and the Royal Air Force by the ability to use bases in Greece and on the Greek islands. The scale is 64 miles to an inch. The price of a paper copy is 1s. 6d., and for one mounted on cloth 3s. 6d. A more elaborate pattern, varnished and mounted on cloth and rollers, costs 5s.

GROUND MAINTENANCE

Broadcast by a Flight-Sergeant of Fighter Command

This Flight-Sergeant is in charge of the maintenance crews of a Hurricane flight of No. 249 Squadron. The squadron has destroyed 200 German raiders. The Fighter Command's first V.C., Flight-Lieut. Nicolson, was serving in this squadron when he won his decoration

"YOU can take it from me that the maintenance crews are 'flat out.' Each aircraft has its own crew. As a result, everybody is very proud of the fighter in his charge. And a healthy rivalry develops, too. They are like the boys in racing stables who groom their own particular horse, call it pet names, slap it affectionately and kiss it when it wins a race. When they hand it over to the jockey on the big day they believe that their horse is the best that money and care can produce. The maintenance crews on our Hurricanes are like that. I've seen them in the morning, taking the covers off the aircraft, slap it under the belly and say something like: 'Come on, you beauty, plenty of Huns to-day, please!'

"Once a pilot came back from a battle after shooting down a Junkers 88 and two Messerschmitts. The crew that serviced that Hurricane did a war dance and went about swanking to the other crews. They regarded the three at one crack as *their* work. Then I've heard them comparing notes like: 'How many bullet holes did yours get back with to-day?' And the reply: 'Only one.' And then the first crew say triumphantly: 'One bullet? That's nothing! We had seven in ours.'

"But there is where the rivalry ends—with good-natured high spirits. It begins with real, hard work, but competitive work, mind you. There is keen competition when the aircraft come back to rearm and refuel. One day, when the squadron landed almost at the same time—I mean in quick succession—it took the maintenance crews only 8½ minutes to rearm and refuel the lot; 8½ minutes from the moment the first machine landed to the time the last

PRE-WAR TRAINING: Armourers rearming the wing guns before the machine has come to rest. This picture was secured at the air exercises in 1938.

FOR THE NEXT DOG-FIGHT: Wing gun batteries are attended to simultaneously to save time.

machine was ready for the air again, each aircraft having been filled up with petrol and ammunition for another battle.

"We work long hours, but we don't mind. Our day starts before dawn. The first task is to take the sleeves off the main planes and the canvas covers off the cockpit hoods. Then the screw pickets which have tied the aircraft down all night are taken up. The fitter gets into the cockpit and the rigger stands by the starting motor. The engine is started up and run until warm. Then, should there be an alarm, there will be no trouble about starting the aircraft or getting it off the ground quickly.

When the Alarm is Sounded

"Suppose there is an alarm. The message comes through by telephone, and immediately I dash out and shout the signal for every crew to go to their own particular aircraft and start up. At the same time, the pilots come from their crew room and scramble into their aircraft. Sometimes the pilot arrives at the same time as the crew, but as often as not the engine is started when he races up. If it takes longer than I think it should from the warning to the time all the aircraft are in the air, well, there is usually an inquest at which I am the coroner. If there has been any delay, I want to know why, because every second is precious, and might mean the difference between ten Huns or no Huns at all.

"Well, eventually, the fighters come back. Perhaps they have been in action. As soon as the first one lands, it taxis towards the waiting ground crew. A tanker goes alongside to fill up the petrol tanks. At the same time, the armourers rearm the eight Browning guns. The rigger changes the oxygen bottles and fits the starting motor to the aircraft so that it is ready for the next take-off. Then the rigger takes some strips of fabric which he has brought with him from the crew room and places them over the gun holes. It helps to keep the guns clean and also helps to keep the aircraft 100 per cent. efficient in the air until

A LITTLE TINKERING: (Left) Engine fitters giving a Merlin a modicum of titivation. Note the fabric covering over the gun ports.

GROUND MAINTENANCE (Continued)

the guns are fired. Meanwhile, another member of the crew searches the aircraft for bullet holes, and the electrician goes over the wiring, and the wireless mechanic tests the radio set. Every little part of the aircraft is O.K. before the machine is pronounced serviceable again. All this process should take no more than five minutes, but we allow seven minutes for the whole job. As I said a moment ago, we once serviced a squadron which came back more or less together in 8½ minutes.

"If a Hurricane comes down with a few bullet holes it is my job to see if the injuries are superficial or not. If there are holes through the fabric we quickly patch them up. If there is a bullet through the main spar, then it is a case of a new wing. Should I find a machine to be unserviceable, a spare aircraft is brought for the use of the pilot until his own machine is ready. So the day goes on, this routine happening perhaps two, three or four times a day. Finally, at nightfall, we make the daily inspection. The armourers clean the guns, the fitter checks the engine over, the rigger checks round the fuselage and cleans it, and the wireless man checks the radio set. The instruments man checks the instruments. When everything is O.K. and the necessary papers signed, the machine can be put to bed. The sleeves are put on the wings, the cover is put over the cockpit, the pickets are pegged into the ground and the machine left, heading into the wind, until dawn.

"It sometimes happens that an aircraft needs perhaps a new undercarriage. That means working far into the night until the aircraft is ready to fly again. I remember working with other members of the crew fitting a new undercarriage to a Hurricane which had been damaged on landing. We started at 4 o'clock in the afternoon, and we didn't finish until 4 o'clock the next morning. But when that aircraft came back the next day with a few Huns to its bag it made all our labour well worth while. Like the pilots, we eat our food when we can. If the squadron is sent off at, say, 11 o'clock in the morning,

FOR HIGH FLYERS: Changing the oxygen bottles on a Hurricane.

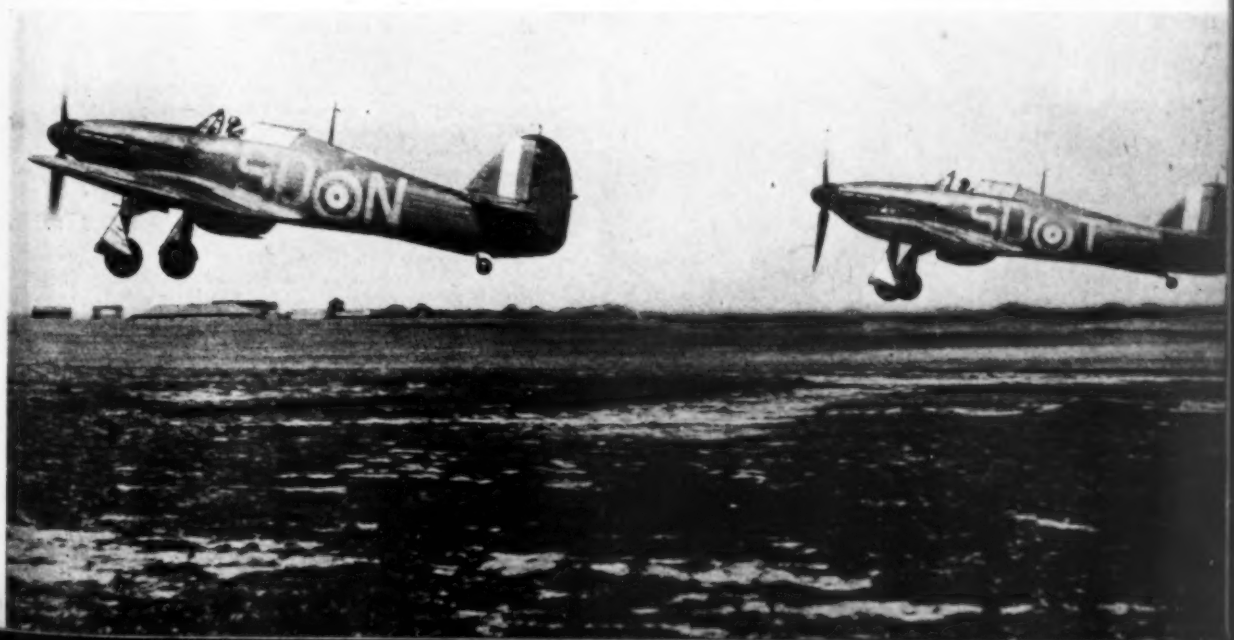
SPIRITED GATHERING: A trio of Hurricanes refill their tanks with leaded fuel.

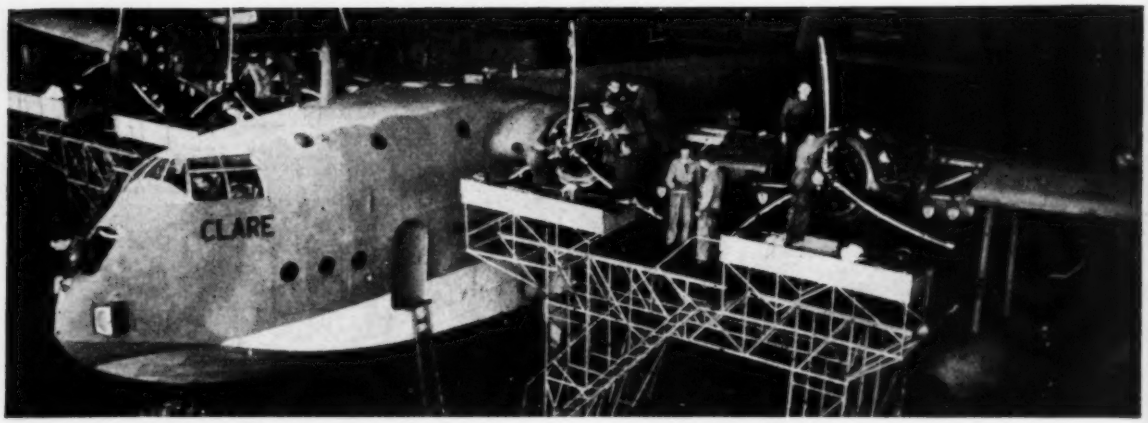
and we know that they probably won't be back for at least an hour, we go for lunch. But we always leave a spare crew on duty to deal with any aircraft—maybe from another squadron—which might land.

"The crews take great pride in the aircraft in their charge. They call their Hurricanes by pet names, always starting with the machine's appropriate letter. Thus you get a machine with the letter 'F' called Freddie, 'Q' Queenie, and so on. They paint mascots on the aircraft, too. 'Freddie,' for instance, bears a picture of Ferdinand the Bull. Another aircraft has a witch on a broomstick, another has George and the Dragon, and they usually paint a tiny swastika along one panel for every Hun the pilot has got. They keep the aircraft spotlessly clean, too. After each trip it is wiped clean of oil, and every other day the Hurricane is washed and scrubbed with soap and water. And they wash behind the ears, too, as though they are washing a small schoolboy! As you may guess, there is not much time for fun and games. Most of the recreation—darts, shove-halfpenny and such-like—are played in the camp, but now and then the airmen get a day off to enable them to find relaxation outside. But generally they are quite happy staying in camp. During the summer-time our hours are from about 3 a.m. until 10.30 p.m., but in winter the hours of daylight are short, giving us a chance to rest.

"May I say a word about the fighter pilots? I think they are a fine lot—as good as they ever were. I've been in the Service since I was a boy in 1923—I'm only 33 now. But I've worked for some grand people. Once I was with some members of the Schneider Trophy teams, when they were instructors at a Central Flying School teaching younger men, now fighter pilots, I suppose, to fly. I am Cornish, though my wife now lives with our three children in the village of Ryther, near Selby, Yorkshire. My family are boatbuilders in Falmouth, and a great-grandfather, or something like that, of mine was a petty officer in Nelson's *Victory*. He helped to conquer one dictator. I hope to do my bit in conquering this dictator."

OFF AGAIN: All the care, training and enthusiasm is devoted to one end—well-tuned aircraft ready at any instant.





After her summer transatlantic work, *Clare* was completely overhauled for the hard days of winter.

LINKING THE EMPIRE AT WAR

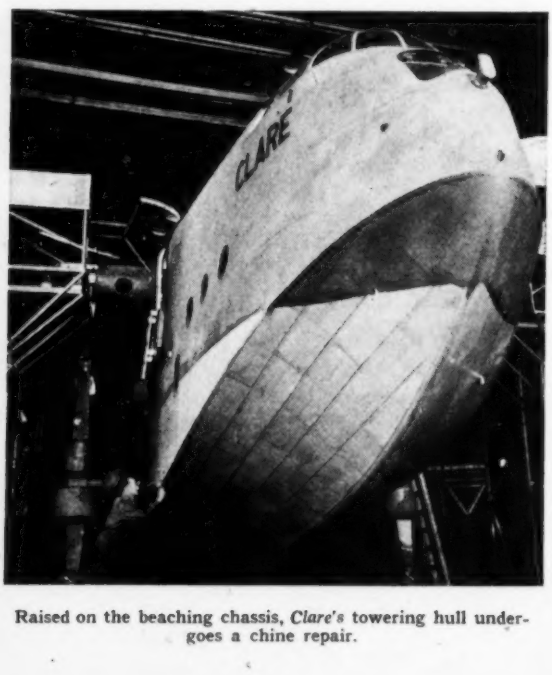
British Airways Fly Five Million Miles in 1940

DURING 1940 British civil aircraft have flown five million miles and carried, besides passengers and freight, nearly 30 million air mail letters. Even in mid-winter, with severe weather added to the already considerable hazards of wartime flying, approximately 100,000 miles are being covered each week by the flying-boats and landplanes of British Airways.

Throughout the year contacts with Europe have been regularly maintained despite the German overrunning of the Continent. On the Lisbon service recently 400 passengers were carried in a month, as well as much mail and freight; on these flights it is no uncommon thing for the passengers to be of five different nationalities, and not long ago eight countries were represented in one aircraft—Great Britain, Poland, Norway, Belgium, France, Japan, Hungary and Luxemburg.

During the summer and autumn the transatlantic flights of *Clare* and *Clyde*, which started at the height of the invasion crisis and were completed after ten crossings without incident or interruption, helped greatly to persuade the American people that Britain was strong and confident in the air, and that German claims of an aerial blockade were false. Special arrangements were made by British Airways to ensure that on each flight the latest editions of English daily newspapers were carried. These were read, analysed and even photographed in facsimile every time they arrived on the other side.

Passengers were carried across the Atlantic on British flying-boats for the first time. They were fifty in number, all of them men at the centre of the war effort in Great Britain, Canada and the United States. It is hoped to resume these flights in 1941.



Raised on the beaching chassis, *Clare's* towering hull undergoes a chine repair.

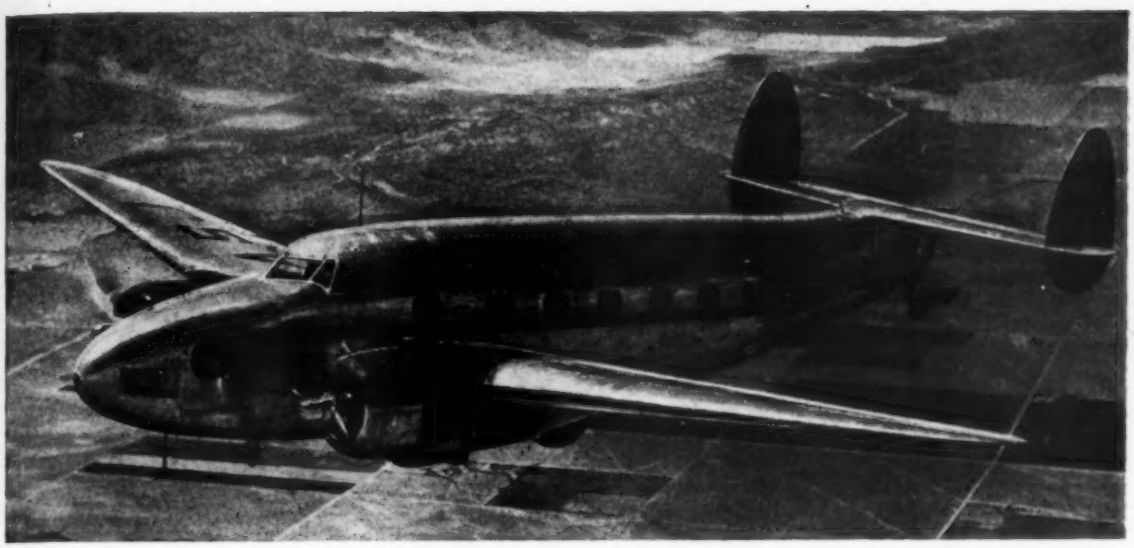
New Routes for Old

The end of the year has found the Empire once again firmly joined by air. A new link has been forged by way of Lisbon to Bathurst, on the west coast of Africa, which has involved a sea crossing of 1,800 miles, roughly equivalent to that of the North Atlantic. When the flying-boats of British Airways began to take this route it was virtually uncharted. There were no weather forecasts or radio reports and none of the elaborate ground facilities of peacetime. Skill and experience in long-distance navigation and great physical endurance were called for from the crews.

Beyond Bathurst there is another long hop, from Freetown to Lagos, more than 1,200 miles, before connection is made with the landplane services which traverse Africa. These landplane flights from the West Coast to Cairo in the east, a distance of 3,500 miles, are made across the heart of the continent, night stops being made at places like Kano and El Fasher, where caravans have met for a thousand years. In the Near East the landplanes once again join hands with the flying-boats, this time on the Empire route, from Durban to Sydney by way of India and Singapore.

The longest air route in the history of aviation ends with the 1,340-mile crossing of the Tasman Sea from Sydney to Auckland, New Zealand, which is made with clockwork precision by the flying-boats of Tasman Airways, *Aotearoa* and *Awarua*, three times each way every fortnight.

The tale of British civil aviation at the end of 1940 is not complete without the chapter that is being written by the Allies. In close co-operation with British Airways, Dutch landplanes, from the fleet of K.L.M., are supplementing our flying boats which go to Lisbon; and in Africa, Sabena, the Belgian national air company, is flying between the West Coast and Egypt by way of the Belgian Congo. The airways not only of the British Empire, but of the Free Empires, are still open.



One of America's latest commercial transports, the Lockheed Lodestar, in flight over California before delivery to South African Airways which is re-equipping almost entirely with this type.

THE LOCKHEED LODESTAR

Particulars of Model 18, Type 17 PCLM, Commercial Transport

THE complete specification details of that modern all-metal American transport, the Lockheed Lodestar, have now been released. Known as the Model 18, it has been ordered in large numbers by airlines all over the world, and deliveries are now being made. Brief technical details were given in *Flight* of January 18th, 1940, but now it is possible to publish full information of this stressed-skin airliner. This has been supplied in most complete form by the company. In fact, it is probably correct to say that the following specification is the most complete which has ever been issued.

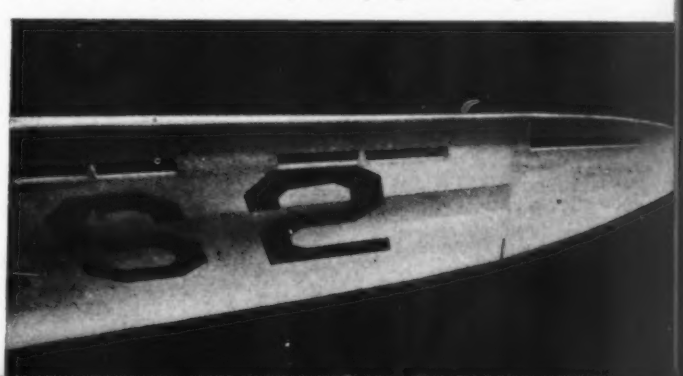
It will be noticed that not only are weights, loadings and performances given, but also such interesting particulars as aspect ratio (which is nearly 8) and wing area, both with and without that area of the fuselage which is always debated as to whether it should be regarded as a part of the lifting surface or not. Also the range of the centre of gravity as a percentage of the mean aerodynamic chord is set down and it may move between .285 and .390. This latter value is very far aft. Airline operators will be interested in the dimensions of the cabin, including the volume of the cargo compartment.

Performance and Equipment

Performance data shows the take-off run to be between 328 and 360 yards (according to type of engine) at the fully-laden provisional weight of 18,500 lb. At the standard gross weight of 17,500 lb. it will be somewhat less. It will be noticed that the landing speed of 65 m.p.h. is for the weight of 17,500 lb. The trend of modern design is seen in the high wing loadings of 31.76 and 33.5 lb./sq. ft. for the two loaded weights. To retain the moderate landing speed of 65 m.p.h. is only possible with the very efficient Fowler flaps which are fitted. Wing tip slots of the built-in type are also provided.

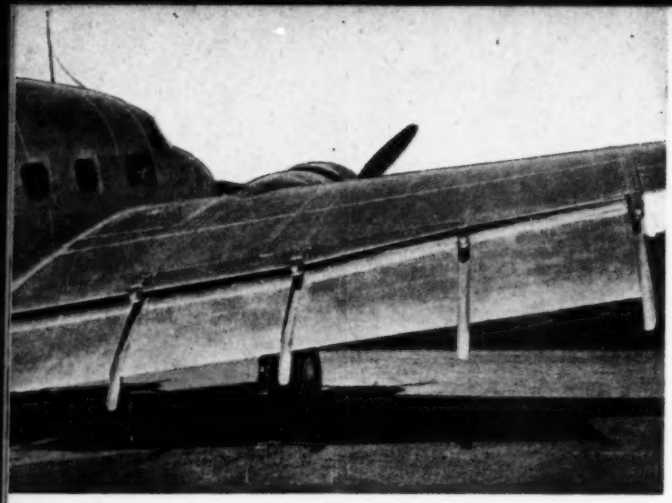
In the illustration it will be noticed that the tailplane sits high on the fuselage. This is the result of research on the prototype, which disclosed a condition of vibration in the tail due to interference of the slipstream and the tailplane. This was completely cured by raising the tailplane about one foot. This commercial transport should be very successful on the air routes of the world.

Equipment: 2 Hamilton Standard, full feathering, 3-blade, Hydromatic, constant speed airscrews. Lockheed-Fowler type flaps. Lockheed slots. Built-in provision for future installation of de-icer boots in leading edge of wing and stabiliser. Twin tabs in ailerons, rudders and elevators. Hold-down straps in all cargo compartments. Electrically illuminated signs, "Please fasten safety belts" and "No smoking." Eclipse Direct Drive starter on each engine. Ash tray, pamphlet pocket, stewardess call button, individual reading light, and hat clip at each seat. Heating and ventilating systems. First-aid kit. Complete lavatory equipment. Optional colours for floor and cabin linings. Pressure fire extinguishers to power nacelles. 1 hand fire extinguisher in cabin and 2 in pilots' compartment. 2 3-minute flares. 1 Flight Instruction Manual. 1 Service Manual. 1 set Engine and Aircraft Log Books. 1 high-pressure air pump for pneumatic shock struts. 2 engine tool kits. 1 Cannon battery cart plug handle. Jack



Fixed slots of the "pillar-box" type are built into the wing tip to guard against wing-dropping near the stall.

THE LOCKHEED LODESTAR (Continued)



The Lockheed-Fowler wing flaps are of large area and move backward and downward to ensure a reasonable landing speed though wing loading is high.

pads for centre section, landing gear fork and tail wheel. 1 tail wheel steering fork. 1 Librascope (load distribution computer). 1 set Lockheed special tools. Compass. Airspeed Indicator. Turn and Bank Indicator. Vertical Speed Indicator. Clock. Gyro Horizon. Directional Gyro (with ball-bank). Sensitive Altimeter. Carburettor Air Temperature Indicators. Fuel Pressure Warning Lights. Outside Air Temperature Indicator. Fuel Gauges. Fuel Gauge Selector Switch. Landing Gear Position Indicator. Wing Flap Position Indicator.

WEIGHTS

Model Number	Engine Type	Standard Gross Weight	Weight Empty	Useful Load (Standard)
		lb.	lb.	lb.
18-10	P & W SIC3-G ...	17,500	12,216	5,284
18-14	P & W S4C4-G ...	17,500	12,291	5,209
18-40	Wright G-102A ...	17,500	11,633	5,867
18-50	Wright G-202A ...	17,500	11,836	5,664
18-56	Wright G-205A ...	17,500	11,846	5,654

Note.—Weight empty includes an allowance of 230 lb. for installation of two-way radio. Weights based on data available November 1st, 1940. For airline use only there is a provisional gross weight of 18,500 lb. For this case the useful load is then 1,000 lb. above the standard useful load.

DIMENSIONS

Length, overall (thrust line level)	49ft. 10in.
Span	65ft. 6in.
Span of the horizontal tail	25ft. 10in.
Mean aerodynamic chord	115.8in.
Landing gear tread	15ft. 4in.
Incidence of wing	2 deg.
Aspect ratio	7.79
Height over cabin (datum line level)	12ft. 3in.
Height over tail (datum line level)	17ft. 10in.
Height over cabin (3-pt. landing)	11ft. 11in.
C.G. range (C.A.A. approved)	28.5 to 39.0 per cent. M.A.C.
Projected wing area, including fuselage	551 sq. ft.
Area covered by fuselage	74.4 sq. ft.
Landing gear	Hydraulic retracting
Size of main wheel tyres	42.3in.
Size of auxiliary wheel tyre	18in.
Volume of passenger cabin	747 cu. ft.
Volume of cargo compartments	190 cu. ft.
Maximum height inside cabin	6ft. 3in.
Maximum length inside cabin	24ft. 6in.
Maximum width inside cabin	65in.
Aisle width (average)	11in.
Seat spacing	37in.

LOADINGS

Lodestar Model	Engine Type	Power, Take-off and Normal	Standard Gross Weight—17,500 lb.	
			lb./h.p.	Wing Ldg.
18-10	P & W SIC3-G ... (14 cyl.).	1200 1050	7.29 8.33	31.76
18-14	P & W S4C4-G ... (14 cyl.).	1200 1050	7.29 8.33	31.76
18-40	Wright G-102A ... (9 cyl.).	1100 900	7.95 9.72	31.76
18-50	Wright G-202A ... (9 cyl.).	1200 1000	7.29 8.75	31.76
18-56	Wright G-205A ... (9 cyl.).	1200 1000	7.29 8.75	31.76

Airscrews: 10ft. 6in. diameter. Normal fuel capacity: 644 U.S. gallons. Normal oil capacity: 40 or 44 U.S. gallons. For provisional gross weight of 18,500 lb. wing loading is 33.5.

PERFORMANCE

(Provisional gross weight of 18,500 lb., except as noted.)

Engineering Design	Unit	SIC3-G 18-10	S4C4-G 18-14	G-102A 18-40	G-202A 18-50	G-205A 18-56
MAXIMUM SPEED						
Sea Level	m.p.h.	238	238	228	236	236
Critical Alt. with ram	m.p.h.	263 at 8800ft.	263 at 8800ft.	250 at 7900ft.	259 at 8200ft.	252 at 5800ft.
Low blower	m.p.h.		276 at 16700ft.			271 at 15300ft.
High blower	% h.p.	62	62	60½	65	65
CRUISING SPEED	b.h.p./eng.	650	650	625	650	650
at Cruising Power	m.p.h.	208	208	204	208	208
At sea level	m.p.h.	217	217	214	217	217
At 5,000ft.	m.p.h.	232	232	229	232	232
At 12,000ft.	m.p.h.	239 at 15000ft.	248 at 19000ft.	229 at 12000ft.	239 at 15000ft.	248 at 19000ft.
Maximum	Sec.	18	18	18	18	18
TAKE-OFF & LANDING	ft.	985	985	1080	985	985
Max T.O. run—S.L.	ft.	1870	1870	1970	1870	1870
Distance required to clear 50ft. obstacle standing start—S.L.	ft.	1750	1750	1750	1750	1750
Distance required to stop after clearing‡ 50ft. obstacle—S.L.	m.p.h.	65	65	65	65	65
Landing speed—S.L.‡ ...	ft./min.	1850	1850	1480	1730	1730
RATE OF CLIMB	ft./min.	370	370	200	303	303
Maximum at S.L. normal power—2 engines ...	ft.	25700	28000	23000	24500	27000
Max. at S.L.—1 Eng.* ...	ft.	11900	13000	9000	10500	13000
CEILINGS	ft.	23500	27000	21800	23500	26000
Absolute—2 engines ...	ft.	10900	10900	8000	9500	10000
Absolute—1 engine* ...						
**Service—2 engines ...						
***Usable—1 engine* ...						

Note.—* Inoperative propeller feathered. ** Service ceiling is altitude where rate of climb is 100 ft./min. *** Usable ceiling is altitude where rate of climb is 50 ft./min. ‡ At standard gross weight of 17,500 lb.

R.A.F. NEEDS ENGINEER-OFFICERS

ENGINEER and other technical officers are still required in the Royal Air Force, and commissions in the R.A.F.V.R. for the duration of the war will be granted to suitable applicants between the ages of 21 and 50 years.

In making this announcement, the Air Ministry stressed the point that candidates who have previously applied for such commissions should not renew their applications, and also that those engaged on the production of aircraft, engines or accessories, or on other important national work should, before submitting their applications, consult their employers as to the possibility of their being spared for R.A.F. duties.

Certain qualifications are required and the vacancies fall under the headings of Engineer, Armament and Signals.

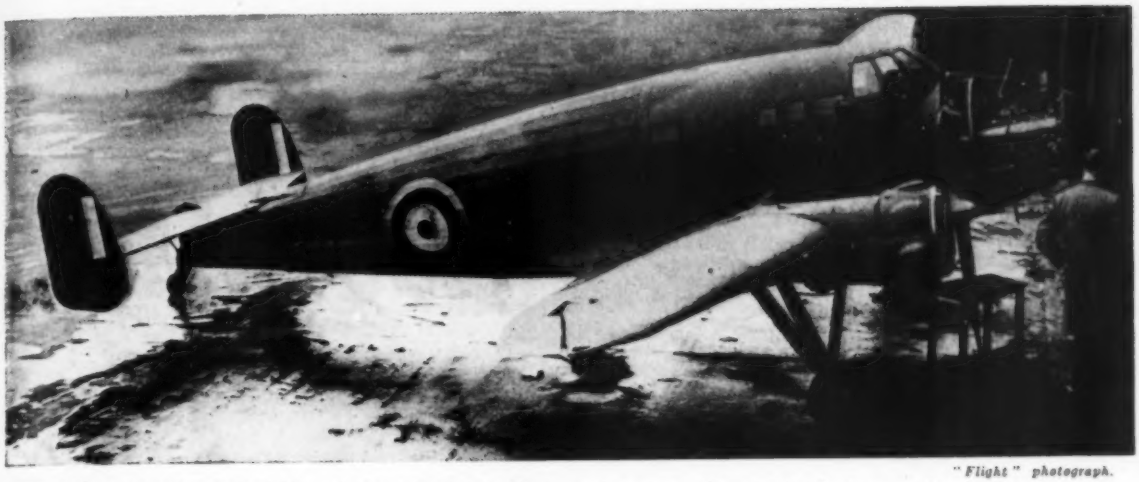
In the first of these, the applicants should either hold a mechanical engineering degree, be a member of an appropriate institution and also have had at least two years' practical experience, or be a practical engineer who has served an apprenticeship followed by a number of years' experience with I.C. engines and aircraft structures. The armament applicant should possess similarly appropriate engineering qualifications, experience in armament manufacture being a particular advantage. Signals applicants should either be holders of electrical engineering or science degrees with experience of wireless, or holders of technical-college or approved institution diplomas with two years' experience in telecommunications engineering.

Vacancies also exist for candidates possessing a sound theoretical knowledge of elementary magnetism and electricity and of the principles of wireless telegraphy and telephony. Some practical experience is desirable.

Candidates for any of these vacancies should apply in writing to the Air Ministry S.7 (e) 1, Adastral House, Kingsway, W.C.2, and give full particulars of their qualifications, training and experience.

New Publication

THE Journal of the Aeronautical Sciences has an offspring which commenced as a monthly in November. Known as *The Aeronautical Review*, the new publication deals exclusively in reviews of books and articles and in lists of reference on aeronautical subjects. It is intended for all the busy people who cannot read all the technical matter but find it essential to know of the various sources of information. In its own words, "*The Aeronautical Review* is not a substitute for books and magazines, but a guide to and through them."



"Flight" photograph.

PRESSURE CABIN RESEARCH. A General Aircraft Monospar has an auxiliary engine in the nose for driving the cabin supercharger.

"PER ARDUA AD ASTRA"

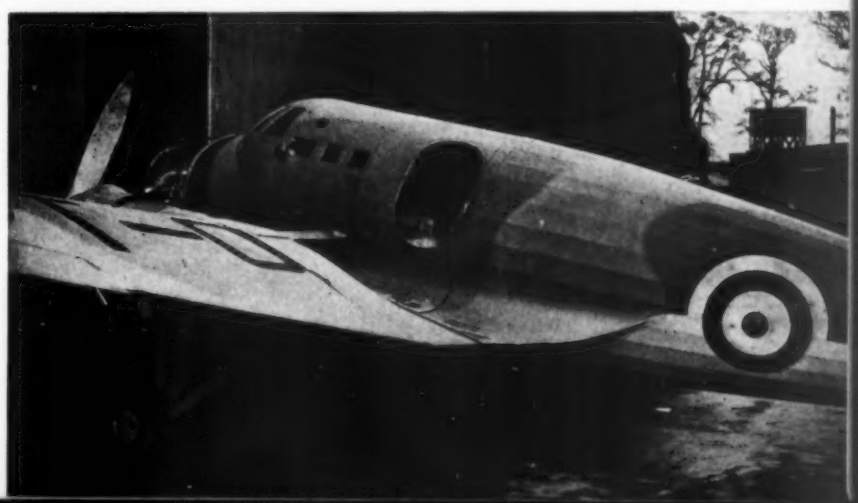
Some Design Problems in the Evolution of High-flying Military Aircraft

By W. O. MANNING, F.R.Ae.S.

IT is absolutely essential that modern military aircraft should be able to operate at great heights. In the case of one aeroplane about to attack another, if the attacker is above the attacked he has the advantage of having a number of foot-pounds of available energy equal, of course, to the weight of the machine multiplied by the difference of the heights, which can be used to increase speed and which would enable a slower aircraft to catch a faster one provided the normal difference in the two speeds is not too great. Again, such an attack has the advantage usually of surprise, especially if the attacker can arrange to dive from the direction of the sun, in which case he is particularly difficult to see. In the case of the bomber, high flying has many advantages; it diminishes the likelihood of an attack from a hostile machine flying at a greater height, diminishes the risk of detection while the bomber is on its way to the target, diminishes the risk of damage from the fire of anti-aircraft guns and, in the case of night operations, the bomber is free from any risk of colliding with a barrage balloon or from being illuminated by the searchlights of the ground defences.

On the one hand, the development of weight-carrying aeroplanes, such as bombers, which can carry a large load to great altitudes, is a difficult technical problem. It is also difficult to provide accommodation for the crew so that they can live and work while the machine they are in is flying in an atmosphere in which breathing is not possible. Suppose that by some means or other the Germans had succeeded in solving this problem and had managed to equip themselves with a type of bomber which could operate at, say, 45,000ft., it is probable that we should find it extremely difficult to protect ourselves. Such things as balloon barrages would obviously be useless, as it is beyond hope to expect to get a barrage balloon up to so great a height as this. Searchlights would probably be equally useless, as the hostile machine, even if illuminated, would be almost too small to see. Whether we have now any guns which would reach to this height is a matter on which I am ignorant, but the types of anti-aircraft guns with which we started the war would not be able to do so, according to information which has been published. Even if a type of gun which could reach this height were produced, the great range would mean that the shooting could not be very accurate and the proportion of machines damaged to those fired at would probably be very small. It would seem, therefore, that our defence would almost certainly have to depend on our fighters and something different from anything we have at present would have to be produced.

On the other hand, accurate bombing from such a height would be impossible, but from the German point of view this would not be a disadvantage. It would be a mere chance if any individual factory were hit, but there would be no possibility of missing a large town such as London or Coventry, so that the whole of the operations of the raid could be carried out at the height mentioned. In our own case, of course, different considerations would apply and, before attacking, our machines would descend to a height at which accurate bombing could be done. But although they would then be subject to the usual defence measures, they would be much safer on their way to and from the target, and risks would certainly be reduced. I



The cabin door of the Monospar is of special design to provide airtightness.

"Flight" photograph.

"PER ARDUA AD ASTRA" (Continued)

think that it could be anticipated that the advent of a high-flying bomber would be a greater advantage to the Germans than to ourselves, and that in order to protect ourselves against such an attack we should have to concentrate on high-flying fighters.

There has in the past been a considerable misconception of this subject of high flying, many people being apparently under the impression that, owing to the thinness of the air at great heights, colossal speeds will be possible. This is not so, as the maximum attainable speed of aircraft depends on the velocity of sound in air, and this figure is independent of the density of the air, is a function solely of the temperature, and becomes less as the temperature falls. As the temperature is always greater near the ground than it is at great heights, it follows that the maximum possible speed of aircraft is greater at low altitudes than it is anywhere else, and would be greater in the Tropics than anywhere else on earth. Again, the L/D ratio of an aeroplane is independent of the density, providing its attitude is unaltered, though its speed varies under these conditions with the density in the ratio of $1/\sqrt{\sigma}$, σ being the ratio of the density at height with the density at ground level, or ρ_h/ρ_o.

Speed at Altitude

What happens actually is that, provided the attitude of the aeroplane remains the same, the speed of the machine is increased while the drag remains the same, so that the horse-power varies with the speed. But the actual fuel required to take an aeroplane from one point to another would be identical at any height under these conditions, provided that the thermal-efficiency of the engine and the propeller efficiency did not change, as can be seen from the condition that the actual energy required to take an aeroplane from one place to another is simply the distance multiplied by the drag. If the efficiencies mentioned above were equal in two cases the fuel consumption would be identical. This statement neglects, of course, the fuel required for climbing, but in a long-distance flight this is not important.

Generally speaking, there is no difficulty in designing an aeroplane for any altitude, provided the necessary power can be provided. The performance calculations present no difficulty either, if the value of ρ appropriate to the height is used. It is probable that all long-distance aircraft of the future will fly at heights of at least 20,000ft., the reason being that the getting-off or landing condition determines the wing-loading of the aircraft. This is always too small for economical flight low down, as at the small angle of incidence necessary the L/D of the aeroplane is small. If the machine is flying at 20,000ft. at the same speed the angle of incidence is considerably greater, and the L/D increases also. This is really the only aerodynamical advantage to be gained by flying high up.

Pressure-cabins

The cabin arrangements of the high-flying aeroplane may cause considerable difficulty in design, especially if the type is intended for military purposes. The pressure-cabin seems to be the only possible solution, and for commercial purposes it does not seem to offer serious design problems. Keeping the pressure up to, say, ground level conditions, warming the air and providing adequate ventilation are certainly difficulties, but they should be solvable with experience. In the case of the Service aircraft, however, the problems are serious. Can a pressure-cabin be used when a bullet hole in it may cause the death of all the crew? How are the guns to be operated, etc.?

There are one or two things to be said about these matters which may suggest that the problem may not be insolvable. Taking the bullet first; it would seem that there should be no great difficulty in plugging the entry hole with, perhaps, a wooden plug prepared for the purpose. This hole is usually small and round, unless the bullet has hit the cabin at a small angle, when it may be a slot. But we have the advantage that the pressure inside the cabin is greater than that outside, so that a rubber patch might be made to stick on. It could be canvas-backed and prepared like the patches used for repairing tyre tubes. The exit hole might be more difficult to deal with as the hole is likely to be jagged, but even then the rubber patch idea might be made to work. It must be remembered in this connection that the pressure inside the cabin is not high. At its maximum it will not be greater than 15 lb. per square inch, and if it is not thought necessary to increase the pressure to full ground-level atmospheric, and remembering that there is always some pressure in the outside air, it might be sufficient to allow for 10 lb. per square inch. Also, compared with the size of the cabin, the holes will not be very large, so there ought to be a minute or two available for making repairs before the pressure leaks out. Further, in the case of a real emergency, a nose-dive to a lower altitude is necessary, and although the crew may temporarily pass out, there is more than a good chance that the pilot will recover in ample time to pull the machine out of its dive and to make a safe landing.

The shell fired by an aircraft cannon is a more difficult problem, but even then a patch might be found adequate, and there is always the nose-dive to fall back on. I am not, of course, suggesting that an ordinary motor patch would be the best thing to use. A special type would have to be developed, possibly padded with sponge rubber, so as to make it fit weli to an irregular surface, possibly shaped to the interior curve of the cabin and almost certainly stiffened in some way so as to help it to take the pressure.

The Gun Problem

Guns, unless of some very special type, could not be fired from inside the cabin. It would not be enough to arrange, say, an airtight ball-joint between the gun barrel and the cabin side as there would always be a serious leak through the barrel whenever the breech was opened. So the gun would have to be left outside and operated by a remote control. All aeroplane and engine controls would have to pass through the cabin walls by means of an airtight joint, but this is only a matter of careful design. Frost or snow on windows might be a nuisance, but it should be possible to design a scraper which could remove it. Or possibly using two thicknesses of glass and passing hot water between them would prove an adequate precaution. On the whole, I think we might sum up by saying that there does not seem to be any insuperable objection to the use of pressure-cabins on military aircraft, though, no doubt, a good deal of experiment would be necessary to get the various details right. Making provision for the necessary windows might easily be one of the principal difficulties in designing the cabin, as these should obviously be as numerous as possible. Glass could be dispensed with, if thought desirable, as any of the modern plastics now used would stand the pressure easily, especially if the thickness were increased somewhat.

A new line altogether might be tried for protecting the cabin itself against the effects of bullet-wounds. Certain types of rubber covering have been found effective in protecting fuel-tanks against bullets and there does not seem to be any reason why a similar method of protection should not work equally well with cabins. In fact, in some ways the problem should be easier, as there is no petrol present with its habit of dissolving most of the rubber-like substances, so that the number of different materials which could be used to cover such a tank would be much greater. This greater choice of materials should make the problem of selecting a satisfactory one much easier.

Minor problems would involve the fitting of modified sights on the machine-guns or cannon, as the low density of the air would reduce the drag of the bullet and the trajectory would be much flatter. This consideration would also affect aircraft-cannon and might be more important in this case owing to the greater range at which

"PER ARDUA AD ASTRA" (Continued)

these guns are used. Owing to the great cold at high altitudes, special precautions would have to be taken either to keep the guns warm so as to prevent the oil freezing, or to use a type of oil which would remain liquid under these conditions. It should also be noted that guns which are being fired will get much hotter, or heat up faster, at high altitudes than they do at ground level. But I shall have more to say about this cooling problem when discussing engines.

The pressure in the cabin would be kept up by an engine-driven pump, which could conveniently be of the centrifugal type. The size of this pump, in Service aircraft, demands special consideration, for it should be ample to keep up pressure when the cabin has been damaged by enemy fire. It is impossible to take too many precautions to ensure that this latter contingency does not become disastrous.

Power Required

We have now to get an idea of how much power will be required for an aeroplane flying at high altitudes. It is not within the scope of this article to go deeply into the design of such a machine, so a number of approximations will be used to simplify the calculations. In order to do this it is convenient to start by assuming we are dealing with an aeroplane which has modern characteristics and that it is proposed to endow it with enough power at a height of 45,000ft. to enable it to have a reasonable performance at this height. We will assume, therefore, that the weight of the machine is 12,500 lb., that its engines provide 1,500 horse-power normally, that it has a wing-loading of 27 lb. per square foot, and that its normal top speed is about 250 miles an hour. As a first approximation it is assumed that the best climb occurs at a C_L of 1, and it follows that the best climbing speed at ground level is about 105 miles an hour. Approximately again, it is assumed that the best climb at all heights always occurs at the same C_L, so that if the machine is at 45,000ft. its best climbing speed will be $105 \times \frac{1}{\sqrt{\sigma}}$

The value of σ appropriate to our chosen height is 0.192, so that the value of $1/\sqrt{\sigma}$ is 2.27. So our required speed works out at 105 x 2.27, or 238 miles an hour, or 350 foot-seconds. The net power required to fly at this height under these conditions will then be 350 x 890 foot-pounds per second. I should say that the figure of 890 lb. is obtained by assuming that the L/D of the aeroplane at a C_L of 1 is 14—another approximation. The net horse-power required to fly is then:—

$$\frac{350 \times 890}{550} = 570 \text{ h.p.}$$

But it is not sufficient to assume that the machine should only have sufficient power to fly at this height. We must have something in reserve, and in order to allow for this it is assumed that it has sufficient additional power to climb at a rate of 500ft. per minute. This is about 8.3ft. per second, so that the additional power required for the climb is:—

$$\frac{8.3 \times 12,500}{550} = 187 \text{ h.p.}$$

Therefore, the total horse-power at this height it will be necessary to provide is 570+187, or 757. It will be assumed that the propeller efficiency is 0.75, so the actual power that the engine will have to produce will be 757 divided by 0.75, or 1,010 h.p. For a rough approximation of the time to height we will assume that such an aeroplane should reach 20,000ft. in 17 minutes. This is a mean climbing speed of 1,180ft. per minute. Guessing, then, that a fair approximation of the climbing speed from this height to 45,000ft. would be 750ft. per second, the time for this remaining 25,000ft. would be, say, 33 minutes. So that the total time to this height would be 50 minutes.

A climbing rate of this order might be a reasonable figure for a long-distance bomber which could remain in the air for many hours and which might be able to afford 50 minutes to get up to its operating height, but would be clearly an impossible figure for a fighter carrying the normal fuel allowance for this type, for it would have no sooner reached this height than the pilot would have to think seriously of going home again. It is obvious, then, that the problem of designing a fighter suitable for such a height is more difficult of solution than that of designing a bomber, for in the former case the proportion of the low-level horse-power which must be developed at height is much greater than in the latter. In other words, it would seem that the problem of attack from great heights is easier than the problem of defence.

From what has been said it will be clear that the problem of the high-altitude fighting aeroplane is very largely an engine problem. Aeroplane design difficulties certainly exist, but methods of getting over them can be suggested and there does not seem to be any difficulty which cannot be solved by experience and careful design. Eventually, beyond doubt, the engine difficulties will also be solved, but they seem to involve much more serious problems than anything to do with the aeroplane.

The Supercharger Problem

Let us start by making an approximate shot at the supercharging problem, bearing in mind that we have found that if our standard type of aeroplane is to fly satisfactorily at 45,000ft., it must have engines which can produce about 1,000 horse-power at that height, compared with 1,500 horse-power at ground level. As the ratio of 1,000/1,500 is about 0.67, we will assume roughly that if we can produce an induction pipe pressure of 0.67 of the atmospheric pressure at ground level we shall get somewhere about our required power. This means an induction pipe pressure of about 10 lb. per square inch. Now, as the atmospheric pressure at 45,000ft. is 1.85 lb. per square inch, the compression-ratio we shall require from the supercharger is 10/1.85, or 5.4. Noting that the standard atmospheric temperature at our chosen height is −55 deg. C., and working the temperature rise out by the usual adiabatic formula, making at the same time an allowance for the efficiency of the supercharger, we shall find that we are faced with a temperature of the air at the supercharger delivery of about 430 deg. C. absolute, which is equivalent to 157 deg. C. We can reasonably deduct 20 deg. from this as an allowance for the heat abstracted by the latent heat of the fuel, leaving 137 deg., which will have to be reduced somehow to, say, 20 deg. C. before it is allowed to enter the engine if the latter is to develop the expected power. The quantity of air which it will be necessary to cool can be roughed out as follows. Suppose our engine has the very reasonable fuel consumption of 0.5 lb. per horse-power per hour (and remembering that the best mixture means an air/fuel ratio of 14), then the amount of air it will be necessary to cool per hour will be 0.5 x 14 x 1,000, or 7,000 lb. per hour. This amounts to 117 lb. per minute. This amounts again to about 2,300 cubic feet per minute at the lower temperature. No easy problem!

The next thing it is necessary to look at is the relative effect of the same radiator at ground-level and at 45,000ft. Let it be assumed that the cooling effect of any radiator is proportional to:—

$$(T - T) \times V^{.7} \times \sigma$$

At the height we are proposing to fly we have the advantage of a higher value of V and a greater temperature difference, but σ, of course, is considerably less. Substituting the actual values in this formula it becomes at ground level 221 and at 45,000ft. 137, so that the ratio, or the relative effect of the same radiator at these two heights and under these conditions, becomes 137/221, or about 0.62. But as the ratio of the horse-power required at ground level and at 45,000ft. is 1,000/1,500, or 0.67, it would seem that the radiator would have to be increased in size about 8 per cent. Engine cooling would thus not present any particular difficulty and air-cooled types could be used

"PER ARDUA AD ASTRA" (Continued)

if desired, though there would be a small increase in radiator weight if fluid-cooled engines were installed.

The engine problem may then be roughly summed up as follows. There is no obvious difficulty in providing the amount of supercharge required, as two or three centrifugal fans in series could be made to provide the necessary pressure, but there is going to be considerable trouble in cooling the air after it has been compressed. It would seem that the only way in which this could be conveniently done would be to utilise the wings for this purpose. Passages might be formed in them through which the air could be passed, but great care would have to be taken to reduce the resistance to the air-flow to a minimum. As this air would have a pressure of some 8 lb. above that of the atmosphere, some stiffening of the covering of the wing would become necessary. It would not be easy to arrange all these matters and at the same time keep the weight down, remembering that the cooling effect of the same sized cooling surface is, under our assumed conditions, some 40 per cent. less than at ground level.

The engine would also be heavier than normal, as the supercharging arrangements would increase the weight materially. There would be additions to the number of fans, increased complication in the gearing, and some form of clutch-gear would be used to prevent excessive supercharging at low altitudes. Probably the various fans would be arranged to cut in at appropriate heights as the machine climbed. It would be possible to arrange for this to be done automatically. Additional weight might also be wanted for the air pump necessary to keep up the pressure in, and to ventilate, the cabin. But here another question arises. As the pressures required are about the same, could we not use the engine supercharging fans for the cabin and thus save the weight and the power of a separate pump? The circuit in this case would be supercharging fans to cooler, then to cabin, and then to engine. Much more air would be supplied by these fans than would be required for ventilation, and it might be necessary for some of it to be by-passed so as to prevent draughts.

But it would be extremely useful to be able to call on the full supply of air in the event of the cabin being punctured by a bullet, so as to keep up the pressure while repairs were being made. Some sort of automatic valve device would have to be introduced so that in the case of an engine stoppage the pressure in the cabin would not fail, remembering that it would escape in this case through the supercharging fans direct to the atmosphere. An ordinary non-return valve would deal with this. It might, however, leak out the other way—between the cabin and the engine—and in this case a non-return valve would not solve the problem as the direction of the air would be the same whether the system was working normally or whether the air was escaping owing to damage. But a valve which operated by the pressure difference between the cabin and the outside air could be used.

In the case of a backfire from the engine some precautions would have to be taken to prevent fumes reaching the cabin, but again one or two automatic valves should solve this problem also. The scheme might have an important advantage in another direction. If the cabin was badly holed so that all the pressure leaked out, the engine supercharge would also disappear and the engine would stop. Hence, even if the crew were rendered unconscious, the aeroplane would immediately begin to descend, and there would be more than a sporting chance of someone reviving in time to take control before the machine reached the ground, whereas if the aircraft continued to fly the death of the crew would be a certainty. Even if there were a crash, with a stopped engine and everything cold, there would be little chance of fire.

THE PASSING OF AMY JOHNSON

THE world heard with deep regret of the death of Amy Johnson in a flying accident on Sunday, January 5th. She was flying a twin-engined trainer aircraft to an R.A.F. aerodrome in the course of her ordinary duty as an A.T.A. ferry pilot, and it would appear that she was considerably off her course, as the accident occurred off the Thames Estuary.

For a time there were rumours of a mysterious passenger who had disappeared, but it seems most likely that the person to whose rescue Lt.-Cdr. W. E. Fletcher, R.N., went, unsuccessfully, was actually Amy, and that the reports of a second occupant arose through mistaking some object from the aeroplane, possibly the parachute, for a human being. Lt.-Cdr. Fletcher, who was a member of the Cambridge University Polar Expedition of 1934, was suffering from exhaustion and exposure, and later he died in hospital. Let us pay homage to the memory of a very gallant gentleman.

As to the cause of the accident we shall probably never know with certainty, but it seems most likely that icing was responsible. Conditions on that day were such that this explanation appears the most likely.

The life of Amy Johnson was an eventful but not a very happy one. From a city office she was attracted to flying, and became a member of the London Aeroplane Club in the days when it operated at Stag Lane. She joined the club in 1928, and took her ticket in the following year. Her first great flight was from England to Australia in a Moth (G-AAAH) presented to her by Lord Wakefield. Leaving England on May 5th, 1930, she arrived at Port Darwin on Empire Day, May 24th.

Afterwards she made many great and hazardous flights, and acquired both fame and fortune. Since the war she had been a pilot in the A.T.A., and there at last found happiness in the knowledge that she was serving her country in its hour of trial.

A *Flight* photograph of Amy Johnson taken in the days when she was a member of the London Aeroplane Club at Stag Lane.

Air Strategy—XXXVI

THE KING-PIN OF OPERATIONS

We Must Revise Our Conceptions of Air Power for Britain

By CAPTAIN NORMAN MACMILLAN, M.C., A.F.C.

IF this war were to be decided on the basis of the Great War I by the killing of the greatest number, whether by bullet, shell, bomb, disease or starvation, the question of available fighting man-power would gradually become a vital factor. British strategy ought to be directed towards the exclusion of available fighting man-power as a factor vital to the winning of this war, for the succinct reason that machine-power is more efficient and can be made the Allies' trump card. If fighting man-power were permitted to become the vital factor the active intervention of the United States upon the side of the Allies would become the *sine qua non* of victory for Britain.

Fighting man-power in war must now be balanced by the man-power required for production, maintenance, transport and distribution. To overdraw upon the balance of the civil population simply to provide fighting man-power must defeat its own object. The correct adjustment of the two needs demands a nicety of judgment to achieve success. To my mind, two pointers are to-day significant. One is that the production of armaments in the United States has been directed to meet the requirements of both Britain and America in a series of standard products; the other is that President Roosevelt has recently reaffirmed that the policy of the United States is to refrain from despatching an Expeditionary Force to fight in Europe.

Machine Power and Man-power

If these two factors, taken together (they were not both referred to in the President's speech), mean anything, it is that Britain and her present fighting Allies must be expected to find the fighting man-power, while America intends (at present) to restrict herself to producing the machine-power.

Obviously, then, as the industrial war output of America shifts up to high gear, it will become possible to release more and more man-power in Britain from the civilian industrial force to increase the fighting man-power. Upon the British race, more than on any other, has fallen the yoke of sacrifice. For that reason, for the preservation of our race, and for the safety of our people, it is imperative for Britain to make this war a war of the machine. Men should be used only to drive the machine. In themselves they ought not to be sacrificed as they were sacrificed in the Great War I.

General Sir Walter Kirke in a recent broadcast war commentary said that he was not one of those who believed that war could be won by air power. He said in the same commentary that the Italians in Africa, although numerically superior in man-power, were inferior in air-power and sea-power, and because of these defects they found themselves in a serious plight. Surely this proves that the machine-power of the air and the sea is superior to the man-power of the soldier even when the soldier is equipped with modern weapons.

Does not this give us the pointer to the strategy which ought to be adopted in relation to the bigger opponent, Germany? Must we not first defeat Germany in the air before we can hope to defeat her on the ground?

It may be coincidence or it may not that the sinkings of merchant ships have decreased since the operational control of the Coastal Command was turned over to the Admiralty; certain it is that since the taking of that decision the major part of the operations of the British Bomber Command has also been directed to assist the war at sea by attacks against targets on the Continent which are primarily of naval importance.

It is also known that German submarine warfare is conducted in a series of wave attacks, hence the peaks and troughs in the graph of past sinkings. Without the intimate knowledge of operations which is the prerogative of the War Cabinet and the Chiefs of Staff, it is difficult for anyone to apportion to their correct cause a diminution in sinkings which have a record of periodicity. Nevertheless, it is significant that the recent decrease in sinkings followed an unusually high rate of loss, and that it was the concomitant of the discharge of exceptional air co-operation in sea war.

Tactical Air Superiority

Taking this assumption (it cannot yet be called more) with the views of Sir Walter Kirke, it is apparent that in land war, and in sea war, local air superiority is of absolute importance. But this is only tactical air superiority bent to the requirements of the strategy of land and sea war. Used in this way air power becomes nothing more than a weapon of the soldier and the sailor, and there is no such thing as air strategy.

Let us look for a moment at the other side of the picture. Was it not lack of air power as much as anything which brought about the present situation? The Army and the Navy have each had to draw upon the resources of an admittedly insufficient Air Force to obtain their essential tactical air superiority; is not that proof that overwhelming air superiority is the key to the whole future of this war? If that be admitted, how is overwhelming air superiority to be applied once it is obtained? Is it still to be tied to the requirements of Army and Navy, or is it at last to be given the opportunity to develop air strategy as the king-pin of war operations?

If the Royal Air Force had had the strength, and if it had been given the opportunity to develop a major strategical operation against Metropolitan Italy simultaneously with the offensive initiated by General Wavell in the Western Desert, there is at least a reasonable chance that Italy would have already collapsed; and that collapse would have come before German help could have reached her. But to have planned such a campaign would have necessitated a reversal of that Imperial strategy which has placed the employment of the Navy and the Army before the employment of the Royal Air Force. To carry out a campaign along such lines would have demanded that the timing of the operation and the disposition of the forces engaged had to link up with the requirements of the Air Arm; the action of both Navy and Army would have been dependent upon the disposition and action of the Air Force.

There is, however, clear evidence that such a course was not contemplated, for it has been officially stated that the initiation of the Greek offensive by Italy made necessary the despatch of British aircraft from the Middle East to Greek territory, and that this action postponed the British offensive in the Western Desert

THE KING-PIN OF OPERATIONS (Continued)

until the aircraft strength could be made up from Britain.

It must, therefore, be assumed that the Western Desert offensive was intended to take place primarily as a military operation, and that it had not included the possibility of Royal Air Force aircraft being able to use aerodromes in Greece for the purpose of attacking targets in the Southern area of Metropolitan Italy; attacks upon any such targets could only have been made by Fleet Air Arm aircraft had it not been for the Italian error in attacking Greece, and their scale would have been a limited one.

Not Planned as Air Operation

If, however, the Western Desert offensive had been planned in the first place as an air operation with naval and military co-operation, attack upon targets in Metropolitan Italy would have been a primary feature of the campaign, and these attacks would have included raids upon all Italian lines of communication right up to the industrial North of Italy. Instead of that, the Western Desert offensive was made a dual military and naval operation accompanied by air co-operation. Most of the attacks launched against Southern Metropolitan Italy have been concerned with targets of naval importance.

Attacks against other parts of Metropolitan Italy during the course of the Western Desert offensive have been too few in number to have results of value.

We have made a nibble at Italy's military and naval forces when we ought to have taken a whole bite at Italian power to wage war. This policy of nibble will continue, I am afraid, so long as Britain's conception of air power remains simply that of a co-operative effort in the strategy of sea and land war instead of being the fundamental basis of all strategy to-day.

One of the fundamental results which must follow the placing of strategy in the hands of naval and land commanders will be the demand for aircraft of types especially adapted to co-operate in naval and land war at the expense of aircraft particularly designed to conduct air war as their primary function. Anyone who has had experience of the requirements for aircraft designed specially for naval use knows that specifications for such aircraft produce a number of detail features which no doubt make them more valuable for purely naval duties, but which have the effect of introducing the inevitable handicaps of the over-specialised product when it is applied to other purposes.

Limited Range

One such feature of the aircraft of the Fleet Air Arm has been lack of range. These aircraft have to be transported by means of aircraft carriers to within reasonable striking distance of their objective. In the main, during the years which preceded the beginning of the present war, the Fleet Air Arm was intended to be an integral part of a Fleet. The aircraft carriers were intended to provide the majority of the aircraft required in a large-scale naval engagement, and in pre-war exercises the aircraft carriers functioned in this manner.

In this war, however (as was not altogether unexpected), the enemy has avoided large-scale naval engagement, and the rôle of the aircraft carriers has therefore had to be diverted to other purposes, mostly connected with attacks against targets in ports or on shore. For such attacks the carrier does not act as an air escort to the Fleet. More probably the Fleet has to act as an escort to the carrier when she has to approach close to shores occupied by the enemy; under these conditions it is obvious that limited range of flight is a distinct handicap.

There are other handicaps associated with the operation of aircraft from carriers when these ships are diverted from the special purpose for which they were at first intended. One very great handicap is the necessity to move the floating aerodrome to the point from which an attack can be launched; this movement has to be made at the speed of the sea, the carrier has to remain in the vicinity during the course of the attack make by her aircraft, and she can only withdraw therefrom at the same slow sea speed after her aircraft have again landed-on. Moving the floating aerodrome forward to get the aircraft within striking range of the target means, with comparatively short-range aircraft, that the number of targets which can be simultaneously attacked is restricted to targets lying along the radii of a narrow arc. Attack operations of this nature made from aircraft carriers are therefore subject to considerable time-lag intervals, and when they are made against shores heavily defended by aircraft or submarines they are fraught with considerable risk.

Not Designed for Patrols

The Admiralty demand for operational control over the Coastal Command is therefore based on the impossibility of a Fleet Air Arm, designed in the first place to co-operate with naval ships in Fleet engagements, being able to convert itself into a Fleet Air Arm suitable for routine duties in connection with a hostile coastline nearly 2,000 miles in length, not counting curves and indentations, from the basin of St. Jean de Luz to North Cape. The Fleet Air Arm was an unsuitable instrument for this work.

Following this argument it may be said that there is no option when the de'il drives. If Hitlerian hordes had not overrun Denmark and Norway, Holland, Belgium and France there would have been no need for the Coastal Command to be placed under Admiralty operational control, for the Fleet Air Arm then, as formerly, would have been able to cope with the duties which naval warfare requires of aircraft.

It was the external situation which required this step of handing over the control of the Coastal Command to the Admiralty to be taken. Possession of the operational control of the Coastal Command at an earlier date would not have enabled the Admiralty to prevent the situation from arising, because the dynamic conditions which produced the situation were outside the power of naval forces to prevent or even hold up appreciably. That applied in Norway where the possibility of naval intervention was at its most favourable landfall in all that long coastline.

Aircraft might have saved the situation in Norway. Aircraft and tanks might have saved the situation in the Low Countries and France. Aircraft might already have brought about the downfall of Italy. And so aircraft enter predominantly into all operations. How, then, is it possible to consider any strategical campaign without taking the Air Arm into the first consideration in relation to the conduct of the whole scheme?

Of one thing I am certain. It is that, until the British High Command begins to understand that past dogmas of strategy are out-moded to-day unless they fit into a strategical scheme which is based upon Air Power as

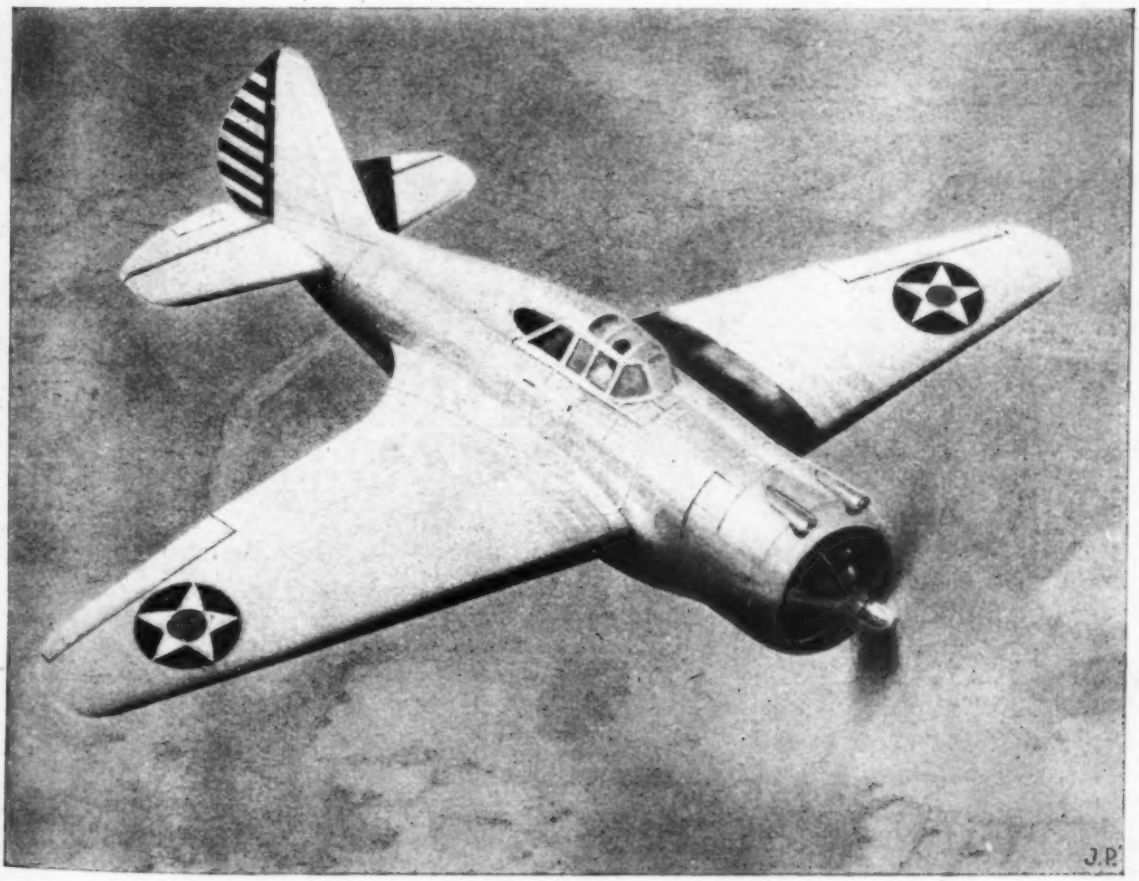
THE KING-PIN OF OPERATIONS (Continued)

the keynote of the scheme, we shall not progress as rapidly with our offensive campaigns as we ought to progress. True, we may have successes in battle. We shall undoubtedly have successes at sea. But these successes, while assisting in the war, are but isolated branches of the whole complex truncated system which we have spread out before us in Europe to-day, and trees are not felled by pruning.

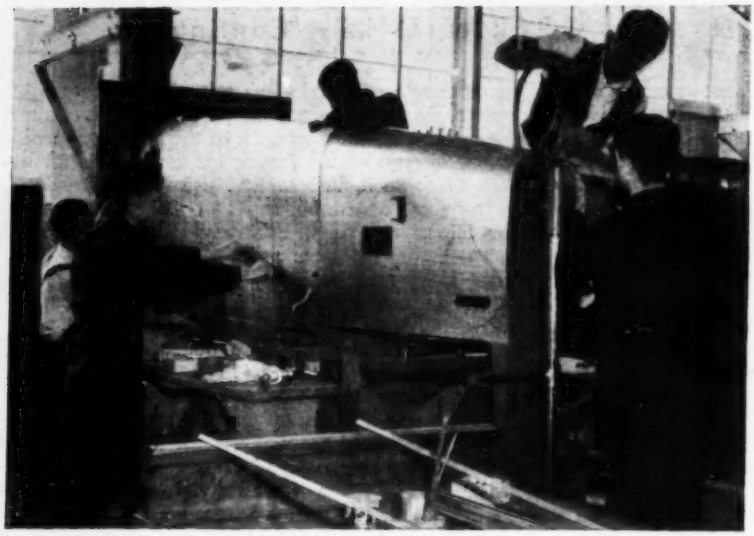
Tactical necessity, then, has brought about a weakening in the strength of the British Independent Air Arm. As to the urgency of that division of air power, the War Cabinet is undoubtedly the body to decide. All the facts are before it. It must decide whether tactical necessity outrides strategical virility. Both in the Western Desert and in the western fringes of almost the whole length of Europe, British aircraft have (except for a small number used occasionally) been relegated to the rôle of tactical necessity. Now tactical necessity is generally imposed by enemy strategy. While British aircraft are so employed we must have a care that we do not take too rosy a view of a situation in which, while engaging in local tactical offensives, we remain strategically on the defensive.

Until Britain possesses sufficient aircraft of the right types to enable us to take the offensive as the greatest air power, we shall continue to be handicapped. So long as enemy strategy imposes upon us the necessity to withdraw our aircraft from strategic employment in air war and to place them into tactical use for the benefit of other services, we cannot say that we have opened a major offensive against Germany, who is our main foe.

If the Navy and the Army have discovered that they cannot operate without such a measure of air support as will denude our Air Arm of its real strategic value, then we must revise all our conceptions of the air strength which we require to win this war. By all means let the requirements of the Navy and Army be filled, for they have their duties to perform, and if those duties cannot be performed without aircraft in large numbers it comes as no surprise to one who has long since seen the penultimate value of aircraft in war. But, if we grant this we must grant, too, that we need vast numbers of aircraft for the independent Air Arm, so that we can continue to wage the war of the machine against our enemy until he is weakened to the point where he can be overthrown. That is the rôle of the aeroplane acting as an independent arm.



AN AMERICAN HIGH-ALTITUDE FIGHTER. This Republican Lancer, fitted with 1,100 h.p. Pratt and Whitney Twin-Wasp engine, has been designed for work at considerable heights. The engine has a special supercharger, but the operational height of the machine is not available. The United States Government has placed an order amounting to 56½ million dollars with the Republic Aviation Corporation, and the machines are to be built at the firm's works at Farmingdale, N.Y. The span is 36ft. and the wing area 223sq. ft. With a gross weight of 6,900lb. the wing loading becomes 31lb./sq. ft.



ANTIPODEAN : Bristol Beauforts are being made at, among other places, the railway aircraft annexe at Chullora, near Sydney, Australia, where this important work can go on out of the gentle Hermann's reach !

HERE AND THERE

The Passing of Capt. Horsey

WE record with sincere regret the death, as a result of a flying accident, of Capt. H. J. Horsey, a founder-pilot of Imperial Airways. Capt. Horsey was, it appears, ferrying a military aeroplane and trouble developed just after the take-off. In hospital he appeared to be making good progress, but hæmorrhage set in. His son Michael, who is a pilot officer in the R.A.F., was with him when he died. "Horse," as he was affectionately called, had flown some 1½ million miles, and had never had a serious crash, nor was a single passenger of any aircraft he piloted ever injured. It seems a cruel trick of fate that after such a record he should end his life on a comparatively trivial flight. To British Overseas Airways, the A.T.A. and his family we extend our sincere sympathy.

Eagle Squadron's First Loss

THE first member of the Eagle Squadron, the all-American fighter squadron of the R.A.F., was buried with military honours last week. He was Pilot-Officer Philip Howard Leckrone, killed in a flying accident, who was one of the many Americans who came over to this country to join the R.A.F. soon after the outbreak of war. P/O Leckrone was buried in the village churchyard near his station in England, and the Stars and Stripes, sent by the American Embassy from London, was draped beside the Union Jack over his coffin. Posted to a Spitfire Squadron soon after reaching this country, he took part in the air-fighting early in the Battle of Britain last autumn. He was 28 years old.

Sir Lancelot Rides Again!

MANY a time has the fighter-pilot been compared with the knight of old—and with every justification—riding the skyways on his aerial charger to challenge the foe in mortal combat. The simile will grow even stronger if anything comes of a development now taking place in the experimental department of the Breeze Corporation, of New Jersey, in the form of bullet-proof armour.

Said to resemble a coat of mail, it conforms to the shape of the human body and fits over the back and top of the head like a cowl, but there is, presumably, no visor. As this modern "tin suit" weighs less than 120 lb.—they say it will be in production in a few weeks—the modern armour-clad knight will be able to mount his steed with considerably less difficulty than was, we understand, experienced by his mediæval ancestor, but whether American ac-emmas will in future be issued with can-openers in case of emergency is not stated!

Milometer for Aircraft ?

IF the claims of a 21-year-old works chemist in Surrey materialise in practice, then a very useful instrument will be added to the already imposing array that faces the pilot of a modern aircraft. For, according to the air correspondent of *The Times*, this young man claims to have invented "an instrument called a milometer for aircraft which will enable pilots to tell what ground mileage they have covered."

No particulars are yet available on the exact capabilities claimed for this instrument, but presumably the inventor believes he has found some means of allowing for drift, otherwise its usefulness would be very limited.

Nobody has yet managed to forge this link between the variable medium in which an aircraft moves and the solid ground beneath it, much less to record the variations on a dial. But if the young Surrey chemist has actually achieved this feat, then the step from air-milometer to ground-speed indicator should be a very simple one !

Aviation Growing Up

IT is often said that aviation is still in its infancy. One begins to doubt if this is really so when one hears that just recently two firms famous in British aviation have presented certificates to employees who have been in the service of the firms for twenty and twenty-five years respectively.

At Rolls-Royce, Ltd., certificates were handed to no fewer than 710 employees who had been in the firm's service for 25 years. The certificates were signed by Lord Herbert Scott, and it had been hoped to make a formal presentation. This, however, was not possible, and the certificates were instead handed to the men while they were at work.

The De Havilland Aircraft Co., Ltd., presented a certificate to 17 men who had been with the company for twenty years; in addition each received a cheque for £20. It is of interest to note that five of the seven directors were included, i.e., Capt. Geoffrey De Havilland, and Messrs. F. T. Hearle, C. C. Walker, W. E. Nixon and F. E. N. St. Barbe.

"The R.A.F. Can Stop Invasion"

AIR CHIEF MARSHAL SIR HUGH DOWDING, former Chief of the R.A.F. Fighter-Command, does not completely share the opinion recently expressed in London by another R.A.F. officer of high rank who said that the Navy and R.A.F. could not defeat an invasion without the help of the Army.

Speaking at Washington, Sir Hugh said that a successful invasion of Great Britain was impossible so long as the R.A.F. maintained its command of the air over this country. He added that even if the R.A.F. had lost command of the air last autumn, thus enabling a German invasion to have been attempted, it would still not necessarily have been successful because the invaders would have had to contend with the Navy and Army.

"The British people will never break under air attack," he said. "They are filled with a cold anger and a steely determination to see the war through."

U.S. Production Plant Extension

ACCORDING to Mr. Arthur Nutt, President of the Society of Automotive Engineers, the expansion facilities in U.S. aircraft production have been "terrific—beyond our greatest hopes."

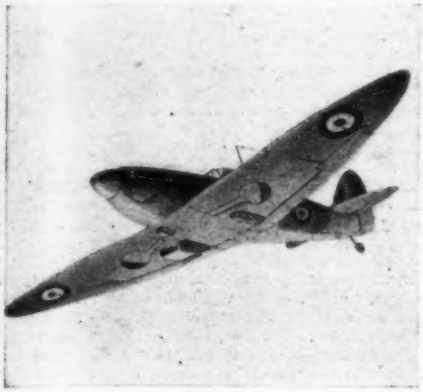
Too pessimistic a view was being taken of the aircraft portion of the national defence programme. "Results may not show yet because it takes time to get started," he said, "but when the plants begin to go they will go very fast."

By means of a questionaire sent out to some 50,000 of its members, the National Association of Manufacturers hopes to obtain, by January 25th, an inventory of their facilities available to the defence programme which are not yet so employed. This covers two-thirds of the country's manufacturing capacity and includes firms both great and small.

FRIEND or FOE?

Identify the Raider at a Glance : Second Article of New Series

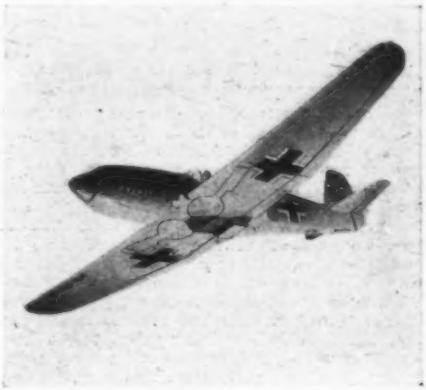
Supermarine Spitfire, Single-seater Fighter



Wheels retract outwards. Exhaust stubs below centre - line. Radiator beneath starboard wing, oil-cooler beneath port wing. Elliptical wings of deep cord set well forward and with fillets at the roots.

IN this, the second in Flight's new series of articles designed to simplify the important task of identifying aircraft, the Heinkel HE 113 is compared with the Spitfire which it resembles in several respects. Distinct differences between these two machines which will enable the spotter to recognise the enemy aircraft almost at a glance, are discussed in these notes. Last week's subject was the Hurricane and the ME 109.

Heinkel HE 113, Single-seater Fighter



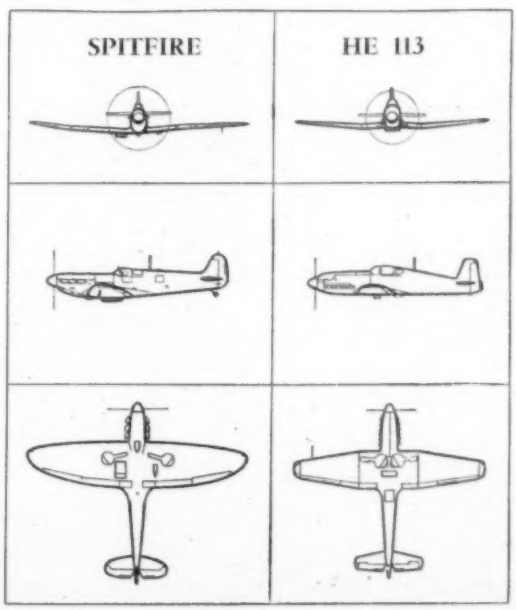
Wheels retract inwards. Exhaust below centre - line. Radiator beneath cockpit. Inverted gull wings, angular and tapering in plan. No fillets. Angular fin and rudder of fairly high aspect-ratio.

THOSE whose duty it is to keep a look-out for hostile aircraft are not primarily concerned to know the exact identity of an approaching machine. One German may be taken to be as fair prey as any other enemy type, including an Italian, should such a surprising phenomenon ever materialise inside these shores. On the other hand, familiarity with the distinctive features of particular types of enemy machines enable quick recognition, which is the object of a spotter.

In comparing, this week, the Heinkel HE 113 with our own Spitfire, the most marked difference is the former's inverted gull wings. But the "gulling" is not so exaggerated as to be readily discernible at any great distance unless the machine is seen head-on or very nearly so. At most other angles of approach what will probably be more quickly observable will be the position of the projecting radiator on the HE 113 directly beneath the pilot's cockpit as distinct from that of the Spitfire, which is below the starboard wing. The British machine, too, has an oil-cooler below the port wing, so that an approaching single-engined fighter seen to possess a bulge under each wing, the starboard one being the larger, may safely be accepted as a Spitfire. On the other hand, the presence of a single "scoop" below the fuselage will not necessarily guarantee hostile identity unless it is accompanied by inverted gull wings. These two features combined, however, will definitely establish the aircraft as an HE 113 and warrant the sounding of the alarm.

Under conditions of poor visibility and low cloud the watcher may never get anything approaching a head-on view of the machine he desires to identify. It may appear almost directly overhead or emerge from cloud to present more or less of a side view, and the inverted gull characteristics of its wings may not be readily apparent. Let us suppose, first of all, that it emerges from cloud almost over the spotter's head. The plan of the wings will immediately indicate its nationality, for one could hardly mistake the elliptical shape of the Spitfire's wings, with their curved fillets where the trailing edges join the fuselage, for the tapering, angular wings of the German fighter. Such wings, accompanied by an inwardly retracting undercarriage, will stamp it as an HE 113, for the wheels of the Spitfire fold outwards, and immediately behind them are the two scoops or ducts already mentioned. Yet another detail to confirm identification is the length of nose projecting in front of the wings. This is much greater in the case of the Heinkel fighter.

Should the machine first present a side view, however, the difference in wing design will probably not be sufficiently obvious to provide a quick and certain means of establishing identity. Look instead for the position of the exhaust stubs and the shape of the tail and rudder. The Spitfire has its exhaust above the centre-line, but on the HE 113 it is well below the centre-line of the symmetrical nose. The fin and rudder of the British fighter are gracefully rounded, but those of the German are square-cut, the rear edge of the rudder itself presenting a straight line sloping outwards towards the bottom. Yet another point of divergence observed at this angle is that whereas the Spitfire's nose is fairly flat on top and rounded beneath and its wings are set well forward, the "snout" of the Heinkel is symmetrical, and projects well ahead of the leading-edge.



Next week: The Bristol Beaufort and the Junkers JU 88.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

SPINNERS

The Authors Elucidate

MR. GILLMORE in his letter published in *Flight* on December 19th, 1940, has misconstrued some of the matter appertaining to the article recently published in *Flight* under the headings "Airscrew Spinners, 1 and 2." In fairness to Mr. Gillmore, however, some of the technical points he has raised call for further enlightenment from the authors. On the other hand, in fairness to the "small people" of the aircraft industry generally, we find it necessary to place on record our opinion that the method of using firms' confidences and policies in order to give weight to his technical differences of opinion is a practice that calls for little commendation. Also, it is common sense that failure on type-test may be caused through simple but unusual conditions not met with before and easily rectified. They come under the heading of development. We are aware of only one extreme case of our spinner fitted to a De Havilland propeller failing. Anyway, the publishing of these facts is, we suggest, taking advantage of an Air Ministry ruling, as it will be appreciated that we do not, as sub-contractors, know the difficulties met with on the De Havilland spinner, but, as main contractors, De Havillands handle the testing, etc., of our spinner when fitted to a De Havilland propeller. The results can apparently be used indiscriminately to their advantage.

Technical Aspects

In answering the technical points raised by Mr. Gillmore we do so assuring him that they are backed up by our own personal developments, and, of course, it is necessary for us to use a certain amount of discretion.

1. Limitation of diameter of 30in. for cush-mounted spinners and cush mountings generally:—Mr. Gillmore infers we state that we consider a rigid-mounted spinner to be more suitable than a cush-mounted spinner when dealing with a spinner of 30in. diameter, and he states their own experience has shown the exact opposite. This is not correct, as we stated that unless certain principles, not given, were adopted it would appear that a rigid spinner would be more serviceable, which is a totally different thing. In fact, cush mountings could be used with advantage, providing they are controlled under the principles we have in mind. For instance, an aircraft fitted with a large spinner making a quick turn would set up gyroscopic loads tending to tilt the spinner. This would load the bushes sufficiently to alter their rate of deflection, thereby, we repeat, highly stressing the bushes and running the risk of resonance taking place, a condition against which the cush mountings are incorporated.

This matter becomes more serious as the diameter increases, and we have taken 30in. diameter as a safety factor ensuring against the foregoing happening, and the possibilities of endangering the lives of R.A.F. pilots, as it will be appreciated that this would not show on bench-test and perhaps not until a considerable amount of flying had been done.

Without going into the technical details, we believe that a rigid spinner which can stand up to engine conditions is a 100 per cent. better spinner than an ordinary cush-mounted one, although we understand the correct functioning of cush mountings, and we are not averse to using them, and appreciate that in some instances they are essential.

2. We suggest, especially in view of Mr. Gillmore's remarks, that the spoked type of spinner is perhaps a little before its time, but unless cowling designers are aware of its existence and advantages when used in conjunction with an improved cowling, it would never be used or even considered, and we therefore thought it advisable to mention it in our article. Mr. Gillmore's main objection was apparently the leaks at the blade openings setting up a certain amount of drag, the solution to which is a thing of the past.

3. Mr. Gillmore points out that on taking a frontal view of the "Albatross" it is obvious that the inlet apertures are not such as to cause excess drag. He is again begging the question, as in our article we do not state that reverse flow cooling does necessarily entail the apertures giving excess drag. Our point was that the drag of reversed-flow cooling spinners was probably lower than that of reversed-flow cooling.

4 It is very difficult to write an article for consumption by the layman and also by the other gentleman, but as the former is in the majority we had endeavoured in our article to cater for him.

Theoretically, Mr. Gillmore is perfectly correct in his precocious analysis of the statement made on what was described by us as the natural tendency of the spinner to avoid penetration by a projectile.

Bullets, or any projectile for the matter of that, when at business are very funny things; therefore a practical example of results achieved is, perhaps, called for. We have placed an armoured plate vertically in front of a 1in. mild steel plate and fired a 0.303 calibre bullet at 100 yards, piercing the armoured plating and making a certain impression in the 1in. thick mild steel plate. We have also rigged up on the firing range a spinner of the same armoured plate having a sharp aerodynamic shape, and revolved the spinner at 1,400 r.p.m. and fired the same calibre bullet at the revolving spinner at 100 yards, with a plate at the back of 1in. thick mild steel at the same distance away as the former mild steel plate. We found a considerable difference in the depth of the impression made by the bullet in favour of the revolving spinner.

In conclusion, the sum total of this matter would appear to be the amalgamation of differences of opinion out of which some good would certainly be established. Or, alternatively, free contract permitted where, in the spirit of true competition, the lead may be given for considerable development, and the resources of this company utilised to a maximum.

CONSTANT SPEED AIRSCREWS, LTD.

GROUND ENGINEERS' EXAMINATIONS

A New Zealand View

WITH reference to the practical tests for the Ground Engineers' Examination, as described in a recent article by Mr. Thomas, I should like to give a Colonial's view on the matter.

In my country, New Zealand, up to the time I left to carry on ground engineer's duties over here, it was necessary for a ground engineer to do both a practical and theoretical examination. The theoretical examination was a three-hour paper on that particular category, and the practical a three- to four-hour bench test. An "A" licence man always had to do a cable splice. I wonder how many "A" licence men there are about who still can't make a decent splice. I know of some.

A point of interest I should like to mention is that both plumbers and electrical wiremen in New Zealand must pass practical and theoretical tests, as well as having three years' experience in their trade before they can be registered.

After this war is over there is going to be a large influx of engineers from the aircraft factories into ground engineer positions. These men, who have only a limited knowledge of the construction of aircraft and engines, will want licences, and under the present system they will get them. Remembering the old adage that "a little knowledge is a dangerous thing," these men must be sorted out by practical, oral and theoretical tests if the present high standard of efficiency attained by the ground engineer to-day is to be maintained.

Before a ground engineer can obtain a licence to-day he must be over 21 years old. That is not enough; the Air Registration Board should also stipulate that the applicant must have had at least two to three years' experience in aircraft or engine maintenance or construction.

I know of cases where people have obtained licences, although twelve months previously they knew nothing about an aeroplane; but by attending a technical school they had absorbed a tremendous amount of theory which enabled them to pass their examinations with ease. And as for being practical, they were useless. I am not running down the technical schools; I consider them marvellous institutions.

I know I am voicing the opinion of the majority of ground engineers on our aerodrome when I say that the Ground Engineers' Examinations must be toughened up, and must include practical tests.

The Air Registration Board at the moment is dormant as regards new categories; and I for one only hope that they are working hard on bringing out a complete new syllabus for the Ground Engineers' Examinations after the war.

ANOTHER P.B.G.E.

THE AIR TRAINING CORPS

R.A.F. Chance for 700,000 Boys : Pre-entry Education : Varsity, School and Local Units in One Scheme

EQUAL opportunities to qualify for commissioned rank in the R.A.F. and Fleet Air-Arm is now extended by the inauguration of the new Air Training Corps to some 700,000 British boys between the ages of 16 and 18 whether they have had the advantage of an expensive public-school education or have gone straight into a factory from an elementary school.

His Majesty the King has graciously consented to become Air-Commodore-in-Chief to the new Corps.

Describing it as "a broad highway into the R.A.F.," Sir Archibald Sinclair, Secretary of State for Air, said that it was the first service movement of its kind on a nation-wide basis and was designed to meet the urgent war requirements and to build up a big reserve to feed the R.A.F. training centres. He pointed out, also, that even if the 16-year-old recruit who took advantage of this pre-entry training scheme was unable to join the R.A.F. before the war ended and, with the return of peace, wished to carry on in his civilian career, he would still find the instruction he had received of inestimable value.

Even boys who were in a reserved occupation (and many occupations were now reserved at the age of 18) and might not be available for Air-Force service, would not be debarred from joining the A.T.C. At the same time it was not intended to approve, at any rate for purposes of financial assistance, units which were composed of employees of particular factories when these were engaged in work of national importance.

The Air Training Corps will consist of University Air Squadrons (the numbers of which will be greatly increased), squadrons and flights formed at schools, and units organised locally. Flexibility is to be the great feature of the whole organisation, and school units will be open not only to old boys of the school, but to other suitable boys living in the vicinity who may wish to join. Local units, also, will be encouraged to provide a similarly wide scope. Responsibility for the training of all units and for the recruitment and administration of local units will be vested in Air Commodore J. A. Chamier, who has been appointed Commandant of the A.T.C. and who has been released from his present R.A.F. duties for this purpose. Air Commodore Chamier, who was Secretary-General of the Air League, was the moving spirit in the development of the Air Defence Corps which now becomes part of the A.T.C. He will be responsible directly to the Air Ministry.

Additionally, the new post of Director of Pre-Entry Training at the Air Ministry has been created, and this will be filled, for the first six months, by Mr F. J. Wolfenden, headmaster of Uppingham School, who has been released for this special service by the trustees of the school for that period. Mr. Wolfenden's special qualifications, said Sir Archibald, made him an ideal man for this responsible post, and he would be able to give the movement a really good start. He would be responsible to Air Marshal A. G. R. Garrod, Air Member for Training on the Air Council

No Class Distinctions

There, would, Sir Archibald said, be no distinction made between the boy from the elementary school the secondary school, or the public school and university. The minimum age for recruitment was 16 years, but in special circumstances discretion would be allowed in school and local units to accept boys before they had reached their 16th birthday. Boys between the ages of 17½ and 18 would be attested as recruits to the R.A.F. and would then return to their civilian activities and participate in the special educational classes for pre-entry training. Those boys who were suitable for flying duties would carry out a syllabus like that of the Initial Training Wings of the R.A.F., while those whose standard of physical fitness did not quite come up to that demanded for air crews, but who were suitable for enrolment as ground staff would be given special courses in mechanical and wireless trades.

Sir Archibald also stressed the point that enrolment in the A.T.C. was not a full-time occupation. The training would be given in evening classes and at week-ends, and the success of the scheme would be largely dependent on suitable officers coming forward to command and instruct units. It was hoped and believed that a sufficient number of men with previous Air-Force or other service experience, and professional men in reserved occupations, particularly schoolmasters, would volunteer for this vital work. Such volunteers would receive commissions in the R.A.F.V.R., and would wear R.A.F. uniform with a distinguishing badge while performing their A.T.C. duties.

A.T.C. members would wear a blue uniform similar to R.A.F. uniform but with a tunic high at the neck and having buttons which did not need polishing.

Like the Air Defence Cadet Corps, the air sections of the Junior Training Corps at schools would now become part of the A.T.C., and liaison would be established between units of the A.T.C. and neighbouring R.A.F. and Royal Naval Air Stations. Existing units of the Cadet Corps could apply at any time after January 20 to be approved by the Air Council as squadrons of the A.T.C. which would be constituted as from February 1.

Another point stressed by Sir Archibald was that it was not intended that the A.T.C. should supersede in any way the organisations already engaged in giving pre-entry training for the other Services. At the Universities the Senior Training Corps and the University Squadrons would operate in parallel, and undergraduates would be free to apply for enrolment in either. At schools, also, it was proposed to allow boys as free a choice as possible, and the service departments would issue letters of guidance to headmasters as necessary. The same principle would apply in the case of local units of the A.T.C. and other youth organisations who were giving preliminary training for the Army and the Navy.

Air Ministry Grants

Grants to cover the cost of training would be made by the Air Ministry, but the A.T.C. would mainly depend for many of its amenities on local support. Arrangements had already been made for local education authorities to give instruction at Air Ministry expense in mathematics and English for young men of 17½ upwards who were, in all other respects, suitable for air-crew duties. In addition to the Air-Squadrons at Oxford and Cambridge, which lapsed at the outbreak of war, but which were re-formed last term, similar squadrons were now to be formed at Aberdeen, Aberystwyth, Belfast, Durham, Edinburgh, Glasgow, Leeds, Liverpool, Manchester, and St. Andrews. Ground instruction in these squadrons would be similar to that given in the Initial Training Wings of the R.A.F., and it was hoped, at a later date, to arrange also for actual flying training.

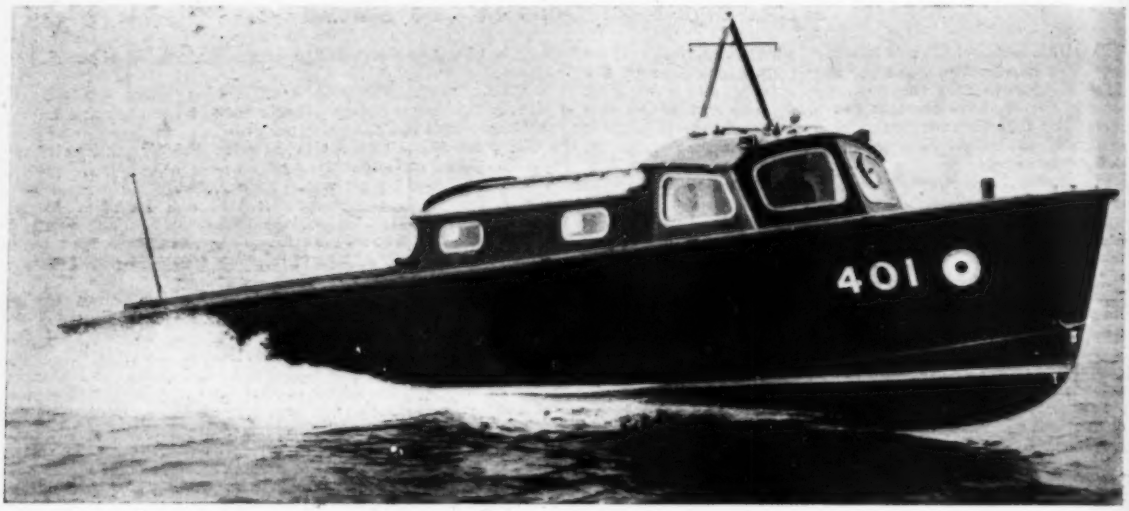
Yet another facet of the general scheme was the institution of special courses at the Universities for young men, from any walk of life, who wished to serve as pilots and observers in the R.A.F. and who were likely to be suitable for commissioned rank. These would be short courses lasting six months and would be taken between leaving school and beginning Service training. Candidates for these special courses would be trained in Service subjects in the University Air-Squadrons and would be instructed by the staff of the University in mathematics and in one of the following subjects: electricity and magnetism, engineering, metcorology and navigation. They would, moreover, become full members of the University, and the Air Ministry would pay the expense of tuition and board and lodging, and the course would be allowed, by the University authorities, to count towards a degree if the candidate returned to the University after the war. On completion of the course these candidates would pass into the ranks and through the Service training schools and, on passing out as qualified pilots or observers, would, if recommended, be commissioned in the R.A.F.V.R. The first course would start about the middle of April. Candidates must be between the ages of 17½ and 18 years 8 months and would be selected by nomination by headmasters of public and secondary schools. The last day for nomination is February 15, and young men who have left school but are still within the age limits are also eligible for this special course.

Problem of Recruitment

In announcing the birth of the A.T.C. and outlining its main aspects, Sir Archibald Sinclair said that the whole problem of recruitment for the R.A.F. and Fleet Air-Arm was a very big one. Every pilot and member of an air-crew was a volunteer, and the physical and educational tests were most exacting, and while the available field was limited by a number of considerations, it was realised that it could be very greatly extended by helping certain suitable types of boy over the educational hurdle. This, basically, was the object behind the formation of the Air Training Corps.

VOSPER BOATS FOR THE SERVICES

Rescue and Refuelling Launches in Production



TENDER TENDER: The Vosper 40ft. rescue launch.

THE production of specialised craft for employment by the R.A.F. and Fleet Air Arm calls for a considerable knowledge of aeronautical and marine matters. Vospers are lucky in having, as their Managing Director and designer, Lt. Cdr. Peter Du Cane, who has served in both the Royal Navy and the Auxiliary Air Force.

In addition to the Vosper M.T.B.s, they are building rescue and refuelling launches. The rescue tenders are 40ft. boats, fitted with Vosper converted Vee 8 Ford engines. A maximum speed of between 21 and 24 knots is obtainable, according to the number of Vee 8 engine units employed. These are in service with the R.A.F. and Fleet Air arm.

For refuelling, a number of petrol tankers have been constructed for the R.A.F. to be used in conjunction with flying boats. These craft are 45ft. long and are powered by two Vosper-Ford engines which give a speed of about 9 knots. It is interesting to note that Cdr. Du Cane has recently rejoined the Navy as a member of the Fleet Air Arm. When with the A.A.F. he used to fly Wapitis as a flying officer in No. 601 County of London Squadron. He was placed on the reserve in November, 1931, and devoted his time to the design of high-speed water craft, including the record-breaking Blue Bird II for Sir Malcolm Campbell.

Now, after a refresher course, he is enjoying himself with such things as Fulmars and Grummans. The latter, as is to be expected from its small dimensions, he finds to be very manœuvrable, comparing very favourably with our Gladiator. It must be unique to have reached the rank of Lt.-Commander in the Navy and retire early enough to take on flying duties in the A.A.F. Then, after another retirement, to come back to flying once more in the F.A.A.

TANKER TENDER: The Vosper 45ft. refueiling launch.

Service Aviation

Royal Air Force and Fleet Air Arm News and Announcements

The "Gang Show"

STARTED in 1928, the Scout "Gang Show" under Ralph Reader was known and applauded. In September, 1939, "The Gang Show" was put on a wartime footing, and it was, in fact, the first concert party to play to the B.E.F. in France. Since then several of the original gang have joined the R.A.F., and since their evacuation from France they have given nearly four hundred shows at R.A.F. stations.

They are the R.A.F.'s only official concert party. The company includes two professional actors. All but one were members of the original Boy Scout Gang, which in 1937 was given the honour—unique among amateur companies—of appearing in the Royal Command Performance.

George Cross for Instructors

THE KING has been graciously pleased to approve the award of the George Cross to:—

Sqn. Ldr. John Noel DOWLAND.—In February, 1940, Sqn. Ldr. Dowland succeeded in removing an enemy bomb from a steamship. The bomb was extremely difficult to inspect and handle as it was wedged with its nose penetrating through the main deck. In June, 1940, this officer performed a similar duty with the same efficiency and promptitude on board a trawler. He has displayed conspicuous courage and devotion to duty in circumstances of exceptional danger and difficulty.

LEONARD HENRY HARRISON for conspicuous courage and devotion to duty in circumstances of exceptional danger.

Early last year a ship arrived in port with an unexploded German bomb wedged half-way through the main deck. The bomb was fitted with a fuse of a then unknown type. Mr. Harrison assisted to render it harmless. About a month later he again gave similar assistance in rendering safe unexploded German bombs. His assistance was of particular value on these occasions, as through his own initiative and private study he had become an authority on the fuse and exploder systems in German bombs.

Mr. Harrison is a civilian armament instructor at an Armament Training School. He has served 12 years with the R.A.F., having started his career as an aircraft apprentice at Halton.

Air Aides-de-Camp

THE Air Ministry announces the following appointments as Air Aides-de-Camp to His Majesty:—Group Capt. Hugh Pughe Lloyd, M.C., D.F.C., and Group Capt. William Ernest Staton, D.S.O., M.C., D.F.C., in succession to Air Comdre. Donald Fasken Stevenson, D.S.O., C.B.E., M.C., and Air Comdre. The Hon. Ralph Alexander Cochrane, C.B.E., A.F.C., who relinquished their appointments on promotion to air rank.

Group Captain Lloyd began his service career in the Army, during the last war, serving as a private in the Royal Engineers from 1915 to 1917. He was three times wounded. He was commissioned in the Royal Flying Corps in 1917, and was engaged on Army co-operation in France until the Armistice. The Military Cross was awarded to him in 1918 for gallantry during an offensive bombing patrol.

On August 8th—"the black day for the German Army," when the tide finally turned in our favour—he was at Amiens. He gained the D.F.C. during the subsequent operations.

Since the 1914-18 war Group Capt. Lloyd has won ten years' active service in India; he has four bars to his Indian General Service Medal, and was three times mentioned in despatches. He has been through many engagements with bomber squadrons in Waziristan, Mohmand, the Tirah and elsewhere. In January, 1939, he was back in England, and commanded a Wing equipped with Wellington bomber aircraft until December, 1939, when he took up a staff appointment at Headquarters, Bomber Command.

Group Capt. Staton has been flying since 1917. He served in the last war as a private in the London (Territorial) Regiment until May, 1917, when he received his commission in the R.F.C. He was engaged in flying operations in France, and during 1918 won the Military Cross and the Distinguished Flying Cross and Bar for conspicuous gallantry in destroying enemy aircraft.

In 1927, when a Flight Lieutenant, his name was brought to the notice of the Air Council for gallantry in saving an airman from drowning after a flying accident. Though nearly overcome by petrol fumes he repeatedly dived under water to extricate the airman.

Group Capt. Staton won one of the first three D.S.O.'s awarded to the R.A.F. during this war; this was in February, 1940.

He had led the first pamphlet raid on Berlin on the night of October 1-2, 1939, and he captained the first aircraft to drop bombs on German soil at Sylt on March 19th.

The Bar to his D.S.O. was awarded in June for outstanding gallantry and leadership in recent air operations.

He flew over Rotterdam when it was in flames and later with his squadron he was the first to bomb the Fiat works at Turin.

Since June, 1940, Group Captain Staton has been in command of a Bomber Station, and was promoted to the rank of Group Captain in July, 1940.

Awards

THE King has been pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

DISTINGUISHED SERVICE ORDER.

Wing Cdr. R. A. McMURTRIE, D.F.C., No. 269 Squadron.—This officer displayed determined leadership and sound judgment when during a period of five days in December, 1940, he led three separate bombing missions against a target over 60 miles inside Norway. On the first occasion, despite heavy cloud over sea and land, he successfully located and attacked his objective. He then remained flying in the target area with his lights burning in order to assist subsequent aircraft in finding the target. In the next two raids he again bombed the target heavily with unhurried precision. He has taken part in 76 operational flights, and his leadership and personal example in the air are of the utmost value to the squadron.

BAR TO DISTINGUISHED FLYING CROSS.

Act. Flt. Lt. G. P. CHRISTIE, D.F.C., No. 66 Squadron.—This officer has shown outstanding ability and leadership over a long period of air operations. He is a keen and determined pilot and has destroyed at least seven enemy aircraft.

DISTINGUISHED FLYING CROSS.

Sqn. Ldr. N. G. MULHOLLAND, No. 115, Squadron.—Since August, 1940, this officer has participated in 24 major operations which have entailed over 141 flying hours. One night in December, 1940, undaunted by heavy anti-aircraft fire concentrated on his aircraft, he made several runs over Kiel Harbour and obtained a number of valuable photographs. On the following night Sqn. Ldr. Mulholland obtained a valuable record of the result of the concerted raid upon objectives in Mannheim. By his persistent determination, outstanding skill, courage, and leadership, this officer has at all times set a very high example.

Flt. Lt. J. CUNNINGHAM, A.A.F., No. 604 Squadron.—During the past three months Flt. Lt. Cunningham has carried out 25 night sorties, during which he has destroyed two enemy bombers and succeeded in making seven interceptions. He has at all times shown the utmost enthusiasm to seek and destroy night raiders and has operated with confidence and success in extremely bad weather.

DISTINGUISHED FLYING MEDAL.

Sgt. A. E. JACKSON, R.A.F.V.R., Sgt. G. W. TURNER, R.A.F.V.R., both of No. 83 Squadron.—Sgts. Jackson and Turner were pilot and wireless operator air gunner respectively in an aircraft detailed to carry out an attack on an aerodrome near Bordeaux in the early morning of December 28, 1940. Owing to intense darkness, low cloud and uncertainty of position, Sgt. Jackson considered there was insufficient time to reach this target and decided to attack the submarine base at Lorient. This target was identified from a height of 1,200 ft., and the attack was successfully carried out. Anti-aircraft and searchlight opposition became intense and the aircraft was hit three or four times. One shell burst in the navigator's cockpit and seriously wounded the navigator and destroyed maps and charts. Sgt. Turner succeeded in obtaining communication with a home station, from which he received diversion instructions in consequence of fog at his own aerodrome. He then assisted the pilot to locate this aerodrome, and sent messages requesting the attendance of an ambulance and medical aid for the wounded navigator. In spite of the damage done to his aircraft, Sgt. Jackson succeeded in making a safe landing. The courage and devotion to duty displayed by these airmen on this and other occasions have been of the highest order.

Flt. Sgt. R. H. SMITH, No. 269 Squadron.—One night in December, 1940, this airman successfully navigated the leading aircraft of a formation which attacked a target 60 miles inside Norway. So well did he make use of the little he could see of the sea and mountain tops that the objective was successfully attacked in weather which seemed quite prohibitive to success. Since the beginning of the war he has carried out 138 operational flights consisting of 600 flying hours, and has carried out successful attacks against units of the enemy fleet. He has always shown skill, determination and devotion to duty of a high order.

Sgt. P. F. JACKSON, R.A.F.V.R., No. 604 Squadron.—One night in December, 1940, this airman was the pilot of a fighter aircraft on patrol. While closing in to attack a night raider he was fired on by its rear gunner and was badly cut about the head and face. In spite of his face being covered with blood and only being able to see with one eye, he returned and landed his aircraft safely at his base in poor visibility and without wireless aid. Sgt. Jackson has displayed determination and oustanding eagerness to search and destroy enemy night bombers at the closest range.

Group Capt. Hugh Pughe Lloyd, M.C., D.F.C., who has been appointed A.D.C. to the King.

Sgt. W. SCARROTT, No. 59 Squadron.—One day in December, 1940, this airman was the wireless operator air gunner of an aircraft detailed to carry out a photographic reconnaissance of enemy occupied aerodromes in Northern France. His aircraft was attacked from astern by two Messerschmitt 109s and during the first burst of enemy fire Sgt. Scarrott was wounded in the face and his gun sight was shot away. Despite this he returned a long burst at one of the enemy aircraft, causing it to crash into the sea. He displayed coolness, courage and efficiency of a high order.

Sgt. F. SYMMONS, R.A.F.V.R., No. 115 Squadron.—Since July, 1940, Sgt. Symmons has completed 28 operational flights, totalling 117 flying hours. One night in December as navigator and camera operator he was successful in obtaining valuable photographs of Kiel Harbour despite very heavy anti-aircraft fire. On the following night during an attack on Mannheim he obtained an excellent photograph giving valuable information regarding the damage done. Sgt. Symmons has displayed exceptional skill and coolness, and the success achieved in night photography is largely due to his persistent efforts and devotion to duty.

Mentioned in Despatches

(*Continued from page 40, Jan. 9th, 1941*)

SERGEANTS.

E. R. Abbott, F. A. Abbott, J. Addicott, H. Allan, F. G. Atkins, J. P. Balfour, K. C. Ball, R. B. Barr, R.A.F.V.R., G. F. Bates, H. J. Baxter, C. W. Bell, L. T. Bentall, E. N. Beswick, A. J. Box, D.F.M., H. W. Bradley, G. Brew, W. E. Brown, D. W. Bryant, J. S. Cameron, P. J. Camp, W. S. Carlile, A. L. Carter, C. E. Castle, R. Catterall, G. A. Chalmers, W. H. Cheetham, E. W. S. Chivers, J. H. Clare, L. A. Clarke, A. V. Clowes, D.F.M., A. Cody, P. Cooke, F. Cox, S. C. Cox, P. G. J. Cranley, E. Creeden, P. Cremmins, F. Cullen, J. A. Cummings, J. R. Currie, M. Dalton, W. Day, C. L. Devoy, G. M. Dickson, J. Dickson, J. E. Dilloway, J. F. Dixon, F. J. Donovan, T. B. Donovan, K. J. B. Dunlop, H. N. Edmondson, J. Edwards, C. Ellison, L. T. Evans, J. C. Fahy, A. F. Farrow, E. H. J. Fevre, J. S. Fisher, T. R. Fleetham, J. Fletcher, F. G. Forgeard, H. Flower, L. V. J. Friend, J. Friendly, D.F.M., W. Gamble, A.A.F., F. T. Gamblin, J. F. Garlick, R. Gowing, E. Greenwood, A. E. Gregory, W. E. Gregory, A. Halfpenny, W. H. Hannigan, R. C. Harbourne, D. J. Harden, R. F. Hatherill, J. E. Hatton, A. J. Hawkins, M. Hemingway, W. S. Herring, V. W. Heslop, W. H. Hewlett, J. S. Higgins, H. H. Hilliar, F. R. S. Holben, G. F. Holland, J. A. Holroyd, F. H. Hopper, R. Hoos, J. G. Hooson, W. T. H. Howell, L. J. W. Humphries (since reported missing), T. L. Hunt, L. C. James, R. R. Jeffery, L. C. Jevons, R. G. Jones, R. T. Jones, L. Jowitt, R. W. Keen, R. W. Kemsley, A. J. Kilby, J. Kirby, J. H. Lacey, D.F.M., R.A.F.V.R., D. Laing, G. R. Lawless, A. S. Leal, P. T. Lefvre, P. A. Leins, B. C. Long, A. D. Loten, H. B. F. Lymna, W. M. Mackie, W. H. Mackintosh, F. Makin, D. Mannion (killed in action), G. D. Mansel, H. K. F. Marshall, D.F.M., J. A. Marshall, T. A. Matthews, H. Maudsley, J. E. Mercer, A. P. Mills,

SERVICE AVIATION (Continued)

D. O. Miller, A. J. Moody, H. J. Morgan, J. Morton, F. B. Moss, F. D. Mottram, A. P. Murray, J. B. Nicholson, W. G. Noakes, A. H. Nugent, C. A. O'Donnell, E. T. Osborne, P. G. Ottewill, T. Owen, T. W. H. Paine, W. C. Pay, C. E. C. Payne, W. R. Peake, R. Perkin, L. B. T. Pick, N. Pickering, H. E. Pike, H. E. Preston, J. W. Pritchard, J. E. Proctor, A. A. Purdom, E. Quibell, J. L. Rees, H. W. P. Regnard, R. W. Robinson, G. Robson, H. Robson, J. Rodgers, E. C. Roe, J. T. Rogers, C. F. Rose, D.F.M., F. P. Saunders, W. F. Scottorn, J. Scown, E. D. Sheldrick (since reported missing), A. F. Simmons, G. Simpson, G. Smith, W. E. Smith, R. J. Men. Spalding, J. H. Spatchett, L. E. Stack, C. Stanley, B. K. Staples, A. M. S. Stevens, F. R. Storey, E. A. Stubley, E. E. Sturgeon, J. R. Summers, R. D. C. Tanner, T. L. Taylor, T. R. Tweed, J. C. Usher, P. D. Vickers, H. S. Virgin, A. G. Wallis, S. R. Walton, N. Watson, J. H. J. Watters, W. J. Wilkins, H. Wilkinson, P. E. Wilks, F. Williams, J. W. Willis-Richards, K. S. Wilson, S. J. Woods, E. G. Wren, R. E. Wright, H. Young, B. Agate (Act.), A. E. Aldridge (Act.), G. E. Bessell (Act.), J. Cansdale (Act.), L. S. Fearnley (Act.), J. W. Grindley (Act.), K. F. McMillan (Act.), G. S. Benrose (Act.), R.A.A.F.

CORPORALS.

E. W. Applebee, F. Ashcroft, K. Ashton, L. W. Barlee, A. J. Barlow, R.A.F.V.R., E. G. Bell, H. Binney, E. Board, R. R. Bodden (since reported missing), J. A. Booth, D. Boulton, H. D. Bowd, S. Boys, C. R. Bray, C. J. Bristow, E. S. Browne, F. F. J. Butler, A. H. Byham, T. Camp, H. H. Case, W. M. Chowns, J. H. Clarke, W. J. Coadwell, R. Cobb, R.A.F.V.R., A. G. Coleman, H. A. Collins, J. J. Collins, E. E. V. Cook, E. S. Cooke, J. G. Cottrell, J. Cunliffe, C. J. Cuthbert, A.A.F., S. Daw, A. E. Dean, W. W. Denny, J. Dickinson, H. G. Dimmer, E. Duncan, A. R. Ellis, A. S. Evans, J. D Evry, J. W. Finch, R. O P. L. Findlay, E. W. Fisher, W. H. Gill, S. W. Gould, W. H. Graham, R. M. Gray, A. G. Greeves, F. M. Gwynn, C. Hancock, A. J. Harris, M. S. Harris, W. H. Harris, J. F. G. Hunter, J. R. Ings, J. W. Johnston, W. Kavanagh, F. G. Kay, R.A.F.V.R., F. Kenyon, C. A. F. Kettle, R. Latham, E. E. Lendy, R. E. Lipscombe, G. E. MacKintosh, V.C., F. P. McQuade, J. Maloney, H. G. Martin, G. W. M. Merritt, J. Miles, D. Moor, G. E. Morris, E. Nicholls, T. O'Hagan, J. T. Over, A. Padden, F. B. Palmer, H. Paull, A. E. Pickering, C. C. Piesing, G. Potts, H. Poulter, R. Purvis (since reported missing), P. R. Robinson, T. B. Robinson, J. T. Robson, A. M. Rose, S. M. Russell, W. T. Sapsford, B. A. Slater, H. Smedley, W. O. Smith, B. K. Staples, G. Stephens, F. Stewart, S. Stubbs, W. Sykes, W. A. Tait, A. V. Thomas, J. V Thompson, N. W. Thompson, J. W. Trim, G. R. Tucker, F. R. Uden, W. W. Wareham, J. Waugh, T. Wharton, H. G. Wilson, W. G. Wisbey, J. A. Wright, J. L. Briggs (Act.), L. F. J. O'Kelly (Act.) (killed on active service, R. G. Rogers (Act.).

[The exceptional number of names included in this list make it necessary for us to publish a further instalment in the next issue.—ED.]

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Royal Air Force

General Duties Branch.

Flt. Lt. (Temp. Sqn. Ldr. A. A. Case is granted a permanent commission in the substantive rank of Flight Lieutenant (Oct. 19, 1940).

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—Warrant Officer: (Dec. 9, 1940, Sen. Nov. 29, 1940) F. J. Poulter. Sergeants: (June 16, 1940, Sen. May 2, 1940) C. N. O'Brien; (Nov. 29, 1940, Sen. Sept. 18, 1940) H. J. L. Hallowes, D.F.M.; (Dec. 2, 1940, Sen. Nov. 20, 1940) S. J. B. Hutcherson.

The undermentioned Pilot Officers on probation are confirmed in their appointments:—(Aug. 24, 1940) M. H. Moundsdon; (Sept. 2, 1940) P. M. Dobree Bell; (Sept. 25, 1940) A. R. Zatonski; (Oct. 1, 1940) A. N. R. L. Appleford, P. D. Short, D. A. Taylor; (Oct. 2, 1940) B. L. Duigan; (Oct. 16, 1940) T. R. Gilderthorp, R. J. Cooper, G. J. Cornish, J. L. Heron, A. J. Holland, K. R. Hughes, H. M. Macrossan, P. B. Moore, J. F. Pain, J. O. Slatter, R. E. Kerr; (Oct. 30, 1940) J. C. Dale.

Act. P/O. on probation B. P. McNamara is graded as Pilot Officer on probation, June 1, 1940, and confirmed his appointment Aug. 14, 1940.

The undermentioned Flight Lieutenants are promoted to the rank of Squadron Leaders (temporary) (Dec. 1, 1940).—H. D. Newman, R. D. Stubbs, D.F.C.

The undermentioned Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer (Oct. 21, 1940):—I. N. McDougall, K. W. Worsdell.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(Sept. 3, 1940) P. F. R. Vaillant, D F Laslett, G. C. Gauthier; (Oct. 27, 1940) A. B. Mobley; (Nov. 5, 1940) E. W. Bundock, P. H. Lee; (Nov. 6, 1940) C. G. Fisher; (Nov. 10, 1940) G. B. Walford; Nov. 24, 1940) D. I. McMonnies; (Dec. 18, 1940) R. I. Alexander.

The undermentioned Pilot Officers are promoted to the rank of Flying Officer:—(Sept. 3, 1940) J. Barker; (Oct. 21, 1940) G. E. Weston, P. L. Whitaker, R. P. Beamont, J. A. Whitecross, T. C. McGillivray, A. D. White; (Oct. 25, 1940) R. E. Bary, J. G. Topham, R. G. Lewis, J. C. Carriere, D. G. Clift, J. R. Gardner, R. H. Ashton; (Nov. 5, 1940) G. J. Bell; (Nov. 6, 1940) H. M. T. Héron, P. W Mason, D. N. Stathers, D. R. Griffiths, M. M. Lambert, H. D. Carruthers, D. H. Stuart, B. K. Thomas, R. C. Wright, P. A. Dudeney, J. A. Sherry; (Nov. 18, 1940) F. McK. Goyen; (Dec. 3, 1940) D. H. Sutton; (Dec. 16, 1940) L. E. Giles; (Dec. 23, 1940) A. E. P. Pim.

Air Vice-Marshal J. S. T. Bradley, C.B.E., is granted the acting rank of Air Marshal (Nov. 30, 1940).

The undermentioned are transferred to the Technical Branch (April 24, 1940):—Group Captain: H. J. Roach, O.B.E., A.F.C. Wing Commanders: C. E. H. Allen, D.F.C.; H. I. T. Beardsworth (since promoted), C. T. Walkington, G. T. H. Pack, E. B. Steedman, C. W. Weedon, W. H. Golder, L. G. Harvey, G. H. P. Padley. Squadron Leaders: V. D. Morshead (since promoted), W. Badley, B. G. Farrow (since promoted), G. Lacey, F. Whittle (since promoted), B. Robinson, H. Little, F. H. Cashmore.

The undermentioned are transferred to the Administrative and Special Duties Branch:—(Dec. 11, 1940) P/O. on probation J. S. Machin; (Dec. 14, 1940) P/O. J. C. Nichols-Marcy.

Sqn. Ldr. W. N. McKechnie, E.G.M., is seconded for special duty (Nov. 13, 1940).

Sqn. Ldr. V. A. Pope ceases to be seconded for special duty (Nov. 13, 1940).

P/O. R. P. Cross takes rank and precedence as if his appointment as P/O. bore date Aug. 9, 1940. Reduction to take effect from Oct. 30, 1940.

Act. P/O. on probation A. P. B. G. Sutton relinquishes his short service commission on appointment to a commission in the R.A.F.V.R. (April 1, 1940).

P/O. R. S. A. Jenkyns, 2nd Lt., R.A., relinquishes his temporary commission on return to Army duty (Nov. 27, 1940).

The undermentioned Flying Officers relinquish their commissions on account of ill-health:—(Nov. 19, 1940) F. Carey; (Nov. 26, 1940) J. A. Stuart.

P/O. H. S. Taylor resigns his commission (Jan. 20, 1940).

P/O. D. A. T. Milliken resigns his short service commission (Nov. 14, 1940).

The notification of Aug. 13, 1940, concerning Flt. Sgt. K. S. Smith is cancelled.

Erratum.

In notification of Sept. 20, 1940, concerning Sgt. F. Tribe. *For* Aug. 10, 1940, *read* Aug. 5, 1940.

Technical Branch.

The undermentioned are granted commissions for the duration of hostilities as Flying Officers on probation:—Warrant Officers: (Nov. 12, 1940, Sen. Oct. 25, 1940) E. G. Alford; (Nov. 22, 1940, Sen. Oct. 30, 1940) L. E. Farrell; (Nov. 25, 1940, Sen. Oct. 31, 1940) G. A. Stocker; (Dec. 1, 1940, Sen. Oct. 30, 1940) J. W. G. Butcher; (Dec. 6, 1940, Sen. Oct. 29, 1940) T. C. Whitston. As Pilot Officers on probation:—Warrant Officers: (Nov. 1, 1940, Sen. Oct. 23, 1940) A. E. Spring; (Dec. 6, 1940, Sen. Oct. 24, 1940) A. P. Lemmon. Acting Warrant Officer: (Nov. 21, 1940, Sen. Nov. 1, 1940) F. Sceley. Flight Sergeants: (Nov. 15, 1940, Sen. Oct. 29, 1940) F. J. Friend; (Nov. 19, 1940, Sen. Oct. 28, 1940) J. M. Boyle; (Nov. 20, 1940, Sen. Nov. 4, 1940) G. T. Brown; (Nov. 22, 1940, Sen. Oct. 30, 1940) P. O. Gibson; (Nov. 25, 1940, Sen. Nov. 5, 1940) J. R. Baxter; (Nov. 25, 1940, Sen. Nov. 12, 1940) A. C. Kerr. Sergeant: (Nov. 16, 1940, Sen. Oct. 31, 1940) E. A. Tilt.

The undermentioned Acting Pilot Officers on probation are graded as Pilot Officers on probation:—(Sept. 17, 1940) A. M. Lucas; (Oct. 1, 1940) S. G. Lloyd.

The undermentioned promotions are made.—Wing Commander to be Group Captain (temporary): (Sept. 1, 1940) L. G. Harvey. Squadron Leaders to be Wing Commanders (temporary): (June 1, 1940) W. Badley; (Sept. 1, 1940) F. H. Cashmore, G. Lacey.

Erratum.

In notification of Dec. 3, 1940, concerning W/O. F. P. Gardiner. *For* Sen. Oct. 24, 1940, *read* Sen. Oct. 28, 1940.

Administrative and Special Duties Branch.

The undermentioned are granted commissions for the duration of hostilities as Flying Officers on probation:—Warrant Officers: (Nov. 25, 1940, Sen. Nov. 8, 1940) E. J. Warren; (Nov. 29, 1940, Sen. Oct. 31, 1940) W. J. Hughes; (Dec. 2, 1940, Sen. Oct. 23, 1940) A. G. Rickard. As Pilot Officers on probation:—Warrant Officer: (Dec. 7, 1940, Sen. Oct. 28, 1940) C. Longstaff. Flight Sergeants: (Nov. 11, 1940, Sen. Oct. 24, 1940) H. M. Walker; (Nov. 29, 1940, Sen. Oct. 28, 1940) H. E. Howard. Sergeants: (Nov. 11, 1940, Sen. Oct. 5, 1940) W. K. Lodge; (Nov. 11, 1940, Sen. Oct. 24, 1940) E. J. Watts.

Equipment Branch.

W/O. W. Hore is granted a commission for the duration of hostilities as Flying Officer on probation (July 1, 1940, Sen. Feb. 29, 1940).

Erratum.

In notification of Nov. 12, 1940, concerning I. J. S. Hemming. *For* J. *read* G.

Accountant Branch.

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—Warrant Officer: (Nov. 22, 1940, Sen. Oct. 10, 1940) R. Wilson. Acting Warrant Officer: (Nov. 23, 1940, Sen. Nov. 8, 1940) C. E. Rowland.

F/O. G. G. Robinson is promoted to the rank of Flight Lieutenant (temp.), Sept. 4, 1940. (Substituted for notification of Dec. 10, 1940.)

Princess Mary's Royal Air Force Nursing Service

Sister Miss B. M. Cadman resigns her appointment (Dec. 20, 1940).

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS.

General Duties Branch.

Flt. Lt. S. G. Long is promoted to the rank of Sqn. Ldr. (temp.) (Dec. 1, 1904).

P/O. M. F. Scragg is promoted to the rank of Flying Officer (Dec. 3, 1940).

Royal Air Force Volunteer Reserve

General Duties Branch

The undermentioned are granted commissions for the duration of hostilities as Flying Officers:—(Nov. 23, 1940) W. V. Canton, L. D. Jennings; (Dec. 1, 1940) J. C. Podmore. As Pilot Officers on probation: (Nov. 18, 1940) D. W. Beard; (Nov. 25, 1940) C. R. Greenhill, C. S. Robinson; (Nov. 28, 1940) N. J. Wiltshire; (Dec. 1, 1940) S. Grove; (Dec. 2, 1940) W. E. Holland, A. F. Rowland. Temporary Flight Sergeant: (Dec. 9, 1940, Sen. Nov. 27, 1940) H. R. Bailey. Sergeants: (Aug. 8. 1940, Sen. Aug. 7, 1940) H. Duro; (Oct. 5, 1940, Sen. Sept 29, 1940) J. F. W. Elliott, G. M. Fairbairn, W J. Rees, W. K. Stobbs, J. G. Rogers, M. I. F. Green, B. C. H. Simms. (Substituted for notifications of Nov. 5, 1940, and Nov. 12, 1940.) (Nov. 3, 1940, Sen. Nov. 2, 1940) H. J. R. Barker; (Nov. 13, 1940, Sen. Nov. 6, 1940) C. T. Broad; (Nov. 23, 1940, Sen. Nov. 5, 1940) W. R. Wells; (Nov. 27, 1940, Sen. Nov. 20, 1940) S. C. Jolly, G. L. Mott, P. P. L. E. Welch, A. S. H. Baillie, W. A. S. Elder; (Nov.. 25, 1940, Sen. Oct. 6, 1940) G. R. Timewell; (Nov. 25, 1940, Sen. Nov. 5, 1940) P. C. Campbell, E. J. Lamb; (Nov. 30, 1940, Sen. Nov. 10, 1940) J. N. G. Bateman, D J. Browne; (Dec. 3, 1940, Sen. Nov. 27, 1940) P. C. P. Farnes, D.F.M., S. A. H. Whitehouse; (Dec. 6, 1940, Sen. Nov. 29, 1940) R. H. Fokes, D.F.M.; (Dec. 6, 1940, Sen. Nov. 29, 1940) P. A. Kleboe. Leading Aircraftmen: (Nov. 3, 1940) B. G. Baring-Gould; (Nov 17, 1940) A W. Hutton, J. Baillie, A. F. Bruce, G. M. Fuller, K. F. Glenn, G. E. F. Goode; (Nov. 23, 1940, Sen. Nov. 5, 1940) R. L. Brown, G. B. Sylvester; (Nov. 23, 1940, Sen. Nov. 7, 1940) A. Helme; (Nov. 23, 1940, Sen. Nov 19, 1940) P. K. Clench, D. O. Fraser, P. P. Godfrey, M. E. Jackson, W. N. Kenyon, A. F. Sharp, C. D. M. Thompson, H. P. Wade; (Nov. 24, 1940, Sen. Nov. 7, 1940) A. Frenkel; (Nov. 24, 1940, Sen. Nov. 19, 1940) L. Baron, J. W. Guadiss; (Nov. 24, 1940) J. M. Chadwick, R. L. Cotton, J. P. B. Cushion, L. E. Durrant, T. Griffith-Jones, A. Hughes-Chamberlain, G. Y. Mackie; (Nov. 25, 1940, Sen. Nov. 5, 1940) P. R. M. Albrecht, P. B. Coleman, M. F. C. Halahan, R. B. Newton, M. C. W. Ormond, R. E. Owen, P. Rathie, S. W. Roberts, A. Tooth, V. M. Waugh; (Nov. 30, 1940, Sen. Nov. 5, 1940) H. V. McCaughan; (Nov. 30, 1940, Sen. Nov. 7, 1940) J. R. B. Parsons; (Nov. 30, 1940, Sen. Nov. 10, 1940) C. P. T. Halliwell, C. R. C. Herbert, B. S. B. Johnston, W. McD. Morison; (Nov. 30, 1940, Sen. Nov. 19, 1940) W. F. W. Foster; (Nov. 30, 1940, Sen. Nov. 19, 1940) S. H. Alcock, P. H. D. Brown, D. G. Carter, H. L. Cousins, A. E. Hayward, D. Irving, W. Laidlaw, L. E. Leon, N. A. J. Mackie, G. A. Payn. As Acting Pilot Officer on probation: (Apr. 1, 1940) A. P. B. G. Sutton.

The undermentioned Pilot Officers on probation are confirmed in their appointments (Oct. 22, 1940) T. V. Mitchell; (Nov. 1, 1940) M. T. Stephens; (Dec. 17, 1940) A. J. R. Downes.

The undermentioned Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer: (Oct. 10, 1940) G. S. Stone; (Oct. 19th, 1940) F. McB. Paul; (Oct. 22, 1940) E. H. F. Fuller; (Oct. 23, 1940) A. B. Woods; (Nov. 13, 1940) K. M. Bastin; (Dec. 1, 1940) R. Berry, D.F.C.

Act. P/O on probation A. P. B. G. Sutton is graded as Pilot Officer on probation, Sept. 7, 1940.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant: (Sept. 28, 1940) T. C. Carter; (Nov. 13, 1940) W. Clarke; (Dec. 9, 1940) G. H. Bowes; B. C. Frost.

The undermentioned Pilot Officers are promoted to the rank of Flying Officer: (Sept. 3, 1940) D. H. Nock; (Dec. 9, 1940) T. Allitt. P/O. G. H. Haddland takes rank and precedence as if his appointment as Pilot Officer bore date Nov 6, 1940. Reduction to take effect from Dec. 3, 1940.

Errata.

In notification of Nov. 12, 1940, concerning Sg. J. E. C. Young. *For* Oct. 22, 1940, *read* Oct. 9, 1940.

Notification of Oct. 22, 1940, concerning P/O. F. B. G. Masefield should have appeared under the heading R.A.F. instead of R.A.F.V.R.

Technical Branch.

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation. (Nov. 28, 1940, Sen. Nov. 14, 1940):—Corporals: G. S. Thomas, D. H. Wingrove.

P/O. on probation T. B. Thomson is confirmed in his appointment Dec. 12, 1940.

The undermentioned Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer:—(Sept. 26, 1940) P. Allden; (Nov. 15, 1940) L. T. Eden; (Nov. 25, 1940) P. G. Richardson; (Dec. 11, 1940) J. D. Sumner.

SERVICE AVIATION (Continued)

Balloon Branch.

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—Sergeant: (Dec. 7, 1940, Sen. Nov. 22, 1940) G. K. Fate. Corporals: (Nov. 7, 1940, Sen. Oct. 21, 1940) J. A. Hickman; (Nov. 25, 1940, Sen. Nov. 5, 1940) R. H. Chambers; (Nov. 25, 1940, Sen. Nov. 8, 1940) S. A. Powell; (Nov. 26, 1940, Sen. Nov. 11, 1940) R. G. Bixby, W. B. S. Kincaid, L. C. Lawdham, F. H. Norton, K. L. Terry; (Nov. 27, 1940, Sen. Nov. 11, 1940) A. G. Lamberth; (Dec. 2, 1940, Sen. Nov. 15, 1940) R. Meredith-Brown; (Dec. 4, 1940, Sen. Nov. 14, 1940) G. Brett; (Dec. 7, 1940, Sen. Nov. 22, 1940) G. S. Hoyle, C. W. Beddows; (Dec. 7, 1940, Sen. Nov. 11, 1940) W. T. Lutener. Leading Aircraftmen: (Dec. 4, 1940, Sen. Nov. 15, 1940) R. B. Crombie; (Dec. 7, 1940, Sen. Nov. 22, 1940) F. Fowler. Aircraftmen 1st Class: (Nov. 7, 1940, Sen. Oct. 21, 1940) A. T. F. Cope; (Nov. 14, 1940, Sen. Oct. 31, 1940) A. G. Graham; (Nov. 26, 1940, Sen. Nov. 11, 1940) H. F. F. Streeten; (Dec. 2, 1940, Sen. Nov. 15, 1940) R. R. W. Folley. H. C. Landon-Sorrell; (Dec. 5, 1940, Sen. Nov. 15, 1940) A. A. Mackenzie.

P/O. on probation H. O. Richards is confirmed in his appointment and promoted to the rank of Flying Officer (Oct. 10, 1940).

Administrative and Special Duties Branch.

The undermentioned are granted commissions for the duration of hostilities as Flying Officer on probation:—Warrant Officer: (Nov. 22, 1940, Sen. Sept. 6, 1940) D. Patterson. As Pilot Officers on probation: (June 15, 1940) L. Mercer; (June 25, 1940) J. G. Burnham (substituted for notification of Oct. 15, 1940); (July 24, 1940) J. E. Kidman (substituted for notification of Aug. 27, 1940); (Aug. 24, 1940) H. G. Crawshaw; (Aug. 28, 1940) R. L. Mitchell (substituted for notification of Nov. 19, 1940); (Sept. 30, 1940) C. J. Longmore; (Oct. 3, 1940) J. H. Morren; (Oct. 6, 1940) W. R. M. Tilley; (Oct. 9, 1940) D. G. Shaw; (Oct. 22, 1940) J. C. Connell, W. T. H. Hilpern, K. G. Springhorn; (Nov 1, 1940) F. T. Robinson; (Nov. 5, 1940) G. S. C. Barron; (Nov. 8, 1940) R. Birkett, V. D. Fletcher; (Nov. 14, 1940) D. G. Porteous; (Nov. 15, 1940) P. L. Dickinson, D. V. Wright; (Nov. 21, 1940) R. P. Breffit, S. de V. Clarke; (Nov. 22, 1940) M. J. B. Otter; (Nov. 29, 1940) N. G. Abercrombie, W. J. Abrahams, F. K. Aitken, C. L. Albury, F. C. Anderson, J. Anderson, S. D. Barbour, P. C. Bennett, S. H. Benoliel, J. W. Booth, J. A. Cain, R. K. Callow, W. L. Cameron, J. D. Cartwright, T. Chester, F. Clarke, R. F. D. Collin, J. Harold Darley, T. H. Formby, H. C. Franks, G. George, J. C. Gibbs, W. N. Greasley, A. D. Green, E. S. Hamilton, L. G. Hind, R. Horn, H. J. Horne, H. W. Kerr, R. H. Lamb, G. H. Langlands, E. Lowden, W. S. Mackay, M. McSporran, J. Metcalfe, J. V. Murphy, R. C. E. M. Nash, D. O'Brien, J. N. Palmer, W. Palmer, W. H. Parkinson, C. F. B. Penley, W. H. Perks, F. C. Potts, H. K. Prossor, M.C., D. K. Rice, P. J. M. Robinson, J. F. Rothwell, J. Roylance, C. Sanders, G. E. Sansom, F. Shaw, F. P. Smith, N. E. E. de F. Somers, W. E. Speirs, J. F. Stephenson, C. B. Thomas, N. R. Thompson, V. J. Thornton, D. P. L. Tindall, G. Tracey, N. R. Watts, H. Wilkinson, D. O. Williams, E. A. Wilson; (Dec. 1, 1940, Sen. Aug. 29, 1939) W. C. Mitchell; (Dec. 2, 1940) J. D. Cowley, H. Grime; (Dec. 9, 1940) J. Bradley, L. Copley, M. Douglas, A. A. Frisby, W. P. Harries, F. H. Hodgess, A. L. Johns, C. J. Protheroe, H. C. Shorey, J. F. Swain. Sergeant: (Nov. 26, 1940, Sen. Nov. 1, 1940) A. A. Young. Corporals: (Nov. 18, 1940, Sen. Oct. 24, 1940) P. T. Bowcock; (Nov. 24, 1940, Sen. Oct. 29, 1940) W. McElrea. Leading Aircraftman: (Nov. 14, 1940, Sen. Oct. 24, 1940) H. L. Jones. Aircraftmen 2nd class: (Nov. 14, 1940, Sen. Oct. 29, 1940) R. A. C. V. Burnett; (Nov. 27, 1940, Sen. Oct. 29, 1940) C. Cooper. As Acting Pilot Officers on probation: Aircraftmen 2nd class (Nov. 19, 1940, Sen. Nov. 15, 1940) J. R. Linklater; (Nov. 21, 1940, Sen. Nov. 14, 1940) K. D. Acton, P. Grant, A. S. Owers, F. C. D. Parkinson; (Nov. 22, 1940, Sen. Nov. 14, 1940) O. Garden.

The undermentioned Pilot Officers on probation are confirmed in their appointments:—(Sept. 19, 1940) C. W. R. Hodges; (Sept. 26, 1940) H. A. Buss, O.B.E., D.S.C., A. T. Gammon, O.B.E., (Oct 6, 1940) H. P. Blakely; (Oct. 10, 1940) T. A. S. Harpham; (Nov. 5, 1940) G. G. Braithwaite; (Nov. 8, 1940) A. H. Keenan, D.S.O., O.B.E., M.C.; (Nov. 13, 1940) C. J. Miln; (Nov. 15, 1940) S. A. Thomson; (Nov. 17, 1940) E. T. Downing; (Nov. 20, 1940) R. J. O. Compston, D.S.C., D.F.C., R. Railton, A. J. Cunningham, J. B. Mackie, A. C. Wood, I. McL. C. Power, M. S. Whitehouse, J. E. A. Barton, E. J. B. Rose; (Nov. 23, 1940) Sir R. D. Waterhouse, K.C.B., C.M.G., C.V.O.; (Nov. 24, 1940) A. C. Jones; (Nov. 25, 1940) L. I. Eskell, T. T. Warriner; (Nov. 27, 1940) G. F. Emerton-Court, G. B. Jepson, L. H. Wilkins, D.S.C.; (Nov. 28, 1940) E. Harle; (Nov. 29, 1940) D. MacLaren; (Dec. 1, 1940) W. C. Wilson, D.S.O., O.B.E., M.C.

The undermentioned Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer:—(Nov. 6, 1940) W. W. E. Clarke; (Nov. 20, 1940) H. V. Landsberg, W. G. Greenaway, M.C.; (Nov. 25, 1940) W. Reynolds; (Nov. 27, 1940) G. L. A. Dudeney, R. G. Doig; (Nov. 29, 1940) W. Norman, F. A. Fyfe, (Nov. 30, 1940) T. H. Herriot, M.B.E.; (Dec. 1, 1940) R. M. Montgomery.

The undermentioned are transferred to the Technical Branch:—Flight Lieutenant: (April 24, 1940) R. J. E. Haynes. Pilot Officer on probation: (June 1, 1940) J. L. Woods; (June 26, 1940) E. A. R. Landon; (June 29, 1940) A. E. C. York-Bramble; (Aug. 10, 1940) T. T. Brown; (Aug. 11, 1940) D. M. Jack; (Oct. 7, 1940) J. K. Maw.

Sqn. Ldr. A. W. Shaw relinquishes the rank of Squadron Leader at his own request, and is transferred to the General Duties Branch in the rank of Flight Lieutenant (July 11, 1940).

Hon. Air Comdre. N. Wilkinson, O.B.E., relinquishes his honorary commission and continues to be employed in the Directorate of Works, Air Ministry (Dec. 17, 1940).

The undermentioned relinquish their commissions on cessation of duty:—(Dec. 20, 1940) Sqn. Ldr. G. J. B. E. Massy, M.C.; (Dec. 26, 1940) Flt. Lt. D. A. McFie.

The undermentioned relinquish their commissions on account of ill-health:—Flight Lieutenant: (Dec. 23, 1940) R. Hems. Pilot Officers on probation (Dec. 20, 1940) P. P. D. Pamplin-Green; (Dec. 26, 1940) R. C. Ruck, O.B.E.

The undermentioned Pilot Officers on probation resign their commissions:—(Dec. 8, 1940) W. Lawson; (Dec. 11, 1940) W. M. Alpine.

The notification of Nov. 26, 1940, regarding P/O. on probation W. Houston is cancelled.

Errata.

In notification of Nov. 19, 1940, concerning P/O. on probation P. A. H. Belton. *For* H. *read* F.

Notifications of Dec. 3, 1940, concerning Act. P/O. on probation J. P. Turtle and D. C. A. McPherson, respectively, should have appeared under the heading "Equipment Branch" and not "Administrative and Special Duties Branch."

Meteorological Branch.

The undermentioned Pilot Officers on probation are confirmed in their appointments, Aug. 1, 1940, and promoted to the rank of Flying Officer:—(Nov. 20, 1940) F. R. Ford, W. P. Osmond; (Nov. 21, 1940) L. Marchant, F. J. Phillips; (Nov. 22, 1940) J. E. Blamey; (Nov. 24, 1939) V. P. Kelly; (Nov. 25, 1940) J. B. Leno; (Nov. 27, 1940) L. J. M. Coleby.

P/O. on probation B. O. F. Tott is confirmed in his appointment, Aug. 25, 1940, and promoted to the rank of Flying Officer (Nov 21, 1940).

Equipment Branch.

Sgt. D. E. M. Cayley is granted a commission for the duration of hostilities as Acting Pilot Officer on probation (Nov. 15, 1940, Sen. Oct. 2, 1940).

P/O. on probation V. A. Hamel-Smith relinquishes his commission on account of ill-health (Dec. 24, 1940).

The undermentioned Pilot Officers on probation are confirmed in their appointments, Sept. 9, 1940, and promoted to the rank of Flying Officer:—(Nov. 9, 1940) B. H. Allin, R. H. Knight, R. H. Warr, J. H. G. Wilson.

The undermentioned Pilot Officers on probation are confirmed in their appointments, Sept. 18, 1940, and promoted to the rank of Flying Officer:—(Nov. 17, 1940) D. R. Vickers; (Nov. 19, 1940) R. Bradshaw, J. W. Lovell.

The undermentioned Acting Pilot Officers on probation are graded as Pilot Officers on probation:—(Sept. 27, 1940) F. W. Rayner, E. H. Stevens; (Sept. 28, 1940) C. C. Howitt.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant (temporary) (Dec. 1, 1940):—C. R. Clark, P. H. Thomson.

Accountant Branch.

The undermentioned Pilot Officers on probation are confirmed in their appointments (Oct. 9, 1940):—A. D. S. Anderson, E. J. Barnes, A. W. Bentley, T. G. Blackwell, C. C. Downing.

The undermentioned Pilot Officers on probation are confirmed in their appointments, Oct. 9, 1940, and promoted to the rank of Flying Officer (Nov. 26, 1940):—A. W. Coleman, S. A. Early, R. R. Galloway.

The undermentioned Acting Pilot Officers on probation are graded as Pilot Officers on probation (Aug. 31, 1940):—R. Salomson, W. B. Wood.

Medical Branch.

The undermentioned are granted commissions for the duration of hostilities as Squadron Leader:—(Nov. 26, 1940) A. C. P. Campbell, M.B., Ch.B., F.R.C.P. (E.). As Flight Lieutenants: (Nov. 26, 1940) G. E. Hesketh, M.D., Ch.B., M.R.C.S., L.R.C.P., F. T. Madge, M.D., Ch.B., M.R.C.S., L.R.C.P., D.P.H. As Flying Officers: (Nov. 26, 1940) G. Ashforth, B.M., B.Ch., D. M. R. Barry, M.B., B.Ch., L.M., G. D. S. Briggs, M.R.C.S., L.R.C.P., D.R.O.G., M. A. Charrett, M.R.C.S., L.R.C.P., D. E. Christie, M.B., B.Ch., I. L. W. Clancey, M.R.C.S., L.R.C.P., H. D. Elliott, M.B., Ch.B., C. H. Gibson, L.R.C.P. and S., J. W. K. Harper, M.R.C.S., L.R.C.P., D.P.H., T. H. Hughes, M.R.C.S., L.R.C.P., D.A., J. H. Jacobs, M.R.C.S., L.R.C.P., D. L. Johnson, M.R.C.S., L.R.C.P., P. R. Latcham, M.B., B.S., M.R.C.S., L.R.C.P., P. St. G. Robinson, M.B., B.Ch., A. Skene, M.B., Ch.B., J. A. H. Smart, M.R.C.S., L.R.C.P., R. F. Stronge, M.D., B.Ch., L. L. Whytehead, B.M., B.Ch., M.R.C.S., L.R.C.P.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(Nov. 1, 1940) T. A. James, M.B., Ch.B.; (Nov. 15, 1940) W. Puskett, M.C., M.D., B.S., A. J. Smith, M.R.C.S., L.R.C.P., D.A., W. F. Walton, M.B., B.Ch., M.R.C.S., L.R.C.P.; (Nov 28, 1940) H. G. Vyse, M.R.C.S., L.R.C.P.

Dental Branch

R. L. Etheridge, L.D.S., is granted a commission for the duration of hostilities as Flying Officer (Nov. 26, 1940).

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(Nov. 14, 1940) E. T. Mason, L.D.S., J. L. Trainer, L.R.C.P. & S., L.R.F.P.S., L.D.S., (Nov. 21, 1940) S. P. Ellis, L.D.S.

Chaplain's Branch.

The undermentioned are granted commissions for the duration of hostilities with the relative rank of Squadron Leader:—(Dec. 10, 1940) The Rev. I. Brodie, B.A., B.Litt., the Rev. H. D. Rigby; (Dec. 11, 1940) the Rev. A. W. G. Cope, B.A.

Auxiliary Air Force

General Duties Branch.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(Oct. 14, 1940) C. J. H. Riddle; (Nov. 2, 1940) W. L. Drummond; (Nov. 3, 1940) J. D. Rollinson; (Nov. 4, 1940) A. G. Pallot; (Nov. 5, 1940) R. G. England.

Women's Auxiliary Air Force

Miss E. B. Sandford is appointed Flight Officer (Dec. 12, 1940).

The undermentioned are appointed Assistant Section Officers:—(Dec. 11, 1940) Sgt. Miss M. E. Abbott, Sgt. Miss J. Alexander, A/CW.1 Miss M. T. Aytoun, Cpl. Miss Q. E. S. Bee, A/CW.2 Miss M. E. Dacam, A/CW.1 Miss V. I. Evans, A/CW.1 Miss J. M. B. Gould, A/CW.1 Miss E. F. M. Jones; (Dec. 14, 1940) A/CW.1 Miss M. C. Burton, A/CW.2 Miss K. M. Cross, A/CW.2 Miss B. Morrison Lewis, Cpl. Miss R. Sleight, A/CW.2 Miss F. M. Vestey.

The undermentioned relinquish their appointments:—(Nov. 17, 1940) Asst. S/O. Miss G. M. Wray; (Dec. 14, 1940) Flt./O. Mrs. K. Amers.

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General Duties Branch.

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—Flight Sergeants: (Dec. 10, 1940, Sen. Nov. 29, 1940) D. J. B. Cross; (Dec. 12, 1940, Sen. Dec. 4, 1940) S. G. Betty, D.F.M.; (Dec. 13, 1940, Sen. Dec. 4, 1940 A. C. Graham. Sergeants: (Apr. 1, 1940) H. A. Steele; (Sept. 7, 1940, Sen. Aug. 28, 1940) F. H. P. Austin.

Act. P/O. on probation G. S. Williams is graded as Pilot Officer on probation July 13, 1940, and confirmed in his appointment, Sept. 11, 1940.

The undermentioned Acting Pilot Officers on probation are graded as Pilot Officers on probation:—(May 18, 1940) J. C. Pugh; (July 13, 1940) W. M. Douglas.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(Oct. 9, 1939) M. V. Whitfield (Supplementary List) (Substituted for notification of Dec. 20, 1940); (Oct. 5, 1940) P. H. Woodruff; (Nov. 6, 1940) L. C. Bartram; (Nov. 10, 1940) N. H. Elliot; (Nov. 15, 1940) R. P. Potgeiter; (Nov. 30, 1940) M. E. Redgrave; (Dec. 24, 1940) C. G. Miles; (Dec. 31, 1940) E. G. J. Wakefield.

The undermentioned Pilot Officers are promoted to the rank of Flying Officer:—(Apr. 27, 1940) P. P. Jerce; (Oct. 8, 1940) R. W. A. Turtle; (Oct. 23, 1940) R. C. Brown; (Nov. 6, 1940) J. R. Ritchie, J. P. B. Greenwood, N. P. W. Hancock, G. Marsland, D. A. Pennington, D. S. Yapp, W. R. Assheton; (Nov. 18, 1940) E. J. Durston, T. B. A. Sherrington; (Dec. 3, 1940) A. Warburton, C. R. Hutton; (Dec. 9, 1940) J. Mansel-Lewis, P. H. G. Mitchell; (Dec. 16, 1940) C. W. Doggett, P. V. K. Tripe; (Dec. 27, 1940) H. W. Allinson.

P/O. G. P. Welman relinquishes his short service commission on account of ill-health (Dec. 26, 1940).

P/O. D. G. Macleod (2nd Lt., Black Watch) relinquishes his temporary commission on return to Army duty (Nov. 14, 1940).

Air Cmdre. G. B. A. Baker, M.C., is granted the acting rank of Air Vice-Marshal (Dec. 16, 1940).

Technical Branch.

The undermentioned are granted commissions for the duration of hostilities as Flying Officer on probation:—Warrant Officer: (Dec. 14, 1940, Sen. Nov. 15, 1940) J. M. Gunn. As Pilot Officers on probation:—Warrant Officer: (Dec. 11, 1940, Sen. Oct. 29, 1940) R. A. Godsell. Flight Sergeant: (Dec. 5, 1940, Sen. Nov. 7, 1940) F. H. Marsh.

The undermentioned Flying Officers on probation are confirmed in their appointments:—(June 12, 1940) E. Dracup; (Aug. 10, 1940) P. J. Cains, C. T. Jackaman; (Aug. 11, 1940) C. F. Giles; (Aug. 14, 1940) W. A. Booth; (Aug. 15, 1940) F. T. Beadle; (Aug. 22, 1940) W. L. Mills; (Aug. 26, 1940) G. H. F. Hurst; (Aug. 30, 1940) G. E. Basham; (Sept. 23, 1940) H. Waite.

Wing Cdr. C. T. Walkington is promoted to the rank of Group Captain (temp.) (Dec. 1, 1940).

Sqn. Ldr. H. Little is promoted to the rank of Wing Commander (temp.) (Sept. 1, 1940).

Administrative and Special Duties Branch.

The undermentioned are granted commissions for the duration of hostilities as Flying Officers on probation:—Warrant Officers: (Nov 25, 1940, Sen. Nov. 7, 1940) T. Sexton; (Nov. 29, 1940, Sen. Oct. 25, 1940) W. Walster. As Pilot Officers on probation:—Warrant Officer: (Dec. 9, 1940, Sen. Nov. 15, 1940) J. P. Carlile. Corporal: (Dec. 2 1940, Sen. Nov. 13, 1940) D. W. Thomas.

F/O. K. G. P. Hendrie is transferred to the General Duties Branch (Nov. 1, 1940).

F/O. on probation F. W. Newman is trans

SERVICE AVIATION (Continued)

ferred to the Technical Branch (July 26, 1940).

Equipment Branch.

The undermentioned are granted commissions for the duration of hostilities as Flying Officer on probation:—Warrant Officer: (Nov. 23, 1940, Sen. Nov. 5, 1940) M. P. Purvis. As Acting Pilot Officer on probation:—Sergeant: (Nov. 15, 1940, Sen. Sept. 3, 1940) A. C. Straker.

P/O. on probation R. E. H. Fender is transferred to the General Duties Branch (Aug. 8, 1940).

Royal Air Force Reserve

Reserve of Air Force Officers.

General Duties Branch.

P/O. R. C. Thorn is promoted to the rank of Flying Officer (Oct. 12, 1940).

Ft. Lt. G. J. Holland is transferred to the Administrative and Special Duties Branch (Dec. 21, 1940).

Royal Air Force Volunteer Reserve

General Duties Branch.

The undermentioned officers of the Southern Rhodesian Air Force are granted commissions for the duration of hostilities as Pilot Officers on probation (April 1, 1940):—Flight Lieutenants: (Sen. April 22, 1939) N. S. F. Tyas; (Sen. Sept. 11, 1939) G. A. Smith; (Sen. Nov. 20, 1939) E. T. Smith; (Sen. Dec. 23, 1939) W. F. Bryanton. Flying Officers: (Sen. May 13, 1939) R. J. D. Christie, A. T. R. Hutchinson, E. E. Spence; (Sen. Oct. 17, 1939) S. E. Flett, P. Holdengarde, M. A. Johnson, E. P. Kleynhans, A. S. MacIntyre, L. P. Olver, C. M. Palmer, G. C. Robinson, C. L. Sindall, J. W. J. Taylor, B. D. White; (Sen. Oct. 26, 1939) C. P. Chilvers, H. S. Hales; (Sen. Nov. 14, 1939) J. Walmisley; (Sen. March 1, 1940) E. W. S. Jacklin.

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—(Nov. 25, 1940) A. Howard; (Dec. 9, 1940) J. Atkinson, J. M. Donald. Sergeants: (Nov. 24, 1940, Sen. Nov. 19, 1940) K. C. Wales; (Dec. 6, 1940, Sen. Nov. 13, 1940) C. W. C. Hamilton; (Dec. 6, 1940, Sen. Nov. 27, 1940) E. A. Alexander, N. P. G. Barron, G. E. Bray, A. G. Brownsill; (Dec. 7, 1940, Sen. Nov. 27, 1940) G. G. W. Pledger; (Dec. 11, 1940, Sen. Nov. 29, 1940) J. V. Venn; (Dec. 12, 1940, Sen. Nov 27, 1940) A. H. Tompkins; (Dec. 12, 1940, Sen. Nov 29, 1940) R. H. Kemp-Lewis; (Dec. 13, 1940, Sen. Dec. 4, 1940) E. J. W. Sivers; (Dec 14, 1940, Sen. Nov. 29, 1940) T. H. O. Richardson; (Dec. 15, 1940, Sen. Nov. 29, 1940) M. A. Smith. Acting Corporal: (Nov. 3, 1940) A. S. Ramsey. Leading Aircraftmen: (Nov. 3, 1940) T. R. Cooke, C. H. Farvis, A. A. Ford, C. S. C. McClure, J. Wright; (Nov. 9, 1940, Sen. Nov. 3, 1940) E. B. Brooks, R. L. Hanson, I. G. Mitchell; (Nov. 16, 1940, Sen. Nov. 7, 1940) D. F. R. Whyte, A. C. M. Millar; (Nov. 17, 1940) B. O. Fryer; (Nov. 20, 1940, Sen. Nov 7, 1940) D. M. Batley; (Nov. 23, 1940, Sen. Nov. 7, 1940) K. B. Fuller, A. J. S. Stewart; (Nov. 24, 1940, Sen. Nov. 7, 1940) P. L. Lander, P. A. Annan, J. E. Atkins, P. H. Blake; (Nov. 24, 1940, Sen. Nov. 19, 1940) P. H. Aldridge, A. C. Henderson, W. R. H. Whiting; (Nov. 24, 1940) L. D. Birkett; (Nov. 29, 1940, Sen. Nov. 5, 1940) R. I. Pooley; (Nov. 30, 1940, Sen. Nov. 19, 1940) M. J. David, B. W. M. Jones, P. McMillan; (Nov. 30, 1940) J. L. Baines, L. S. Dobson, T. C. F. Earp, T. P. O'Brien, R. P. Todd, J. O. H. Willing; (Dec. 1, 1940) D. H. M. Jack, C. Langley-Rippon, N. C. Maciver, J. V. Malley, K. G. A. Marsh, P. Molloy, L. J. Moore, P. B. Morris, S. G. Newborough, C. F. Starkey, C. W. M. Powell, A. W. Robson; (Dec. 2, 1940, Sen. Nov. 14, 1940) T. G. V. Roden, J. B. Selby; (Dec. 7, 1940, Sen. Nov. 23, 1940) W. H. King, K. J. A. Reed; (Dec. 8, 1940, Sen. Nov. 23, 1940) K. P. Jones, H. C. Lowcock, H. J. Moore, P. R. B. Salvesen, The Hon. F. H. I. Scarlett; (Dec. 9, 1940, Sen. Nov. 14, 1940) G. A. Skelly, H. K. Smith, J. Waechter, R. C. Webb; (Dec. 9, 1940, Sen. Nov. 23, 1940) B. M. Cavan, P. S. C. Lovelace, I. R. Macintyre, R. E. A. Mason, D. W. Wainwright, D. Winton; (Dec. 9, 1940, Sen. Nov. 23, 1940) H. A. S. Johnston, N. W. Lee; (Dec. 14, 1940, Sen. Nov. 23, 1940) J. A. F. Leaver-Power. As Acting Pilot Officer on probation:—(Dec 1, 1940) D. F. Peel.

The undermentioned Pilot Officers on probation are confirmed in their appointments:—(Oct. 1, 1940) G. A. Worth; (Oct. 16, 1940) J. de la P.-B. Preston; (Oct. 26, 1940) M. J. B. Stoker; (Oct. 28, 1940) P. C. Hoyle; (Dec. 10, 1940) D. L. Armitage.

The undermentioned Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer:—(Nov. 23, 1940) C. A. Maton; (Dec. 1, 1940, Sen March 29, 1940) E. D. Parker, D.F.C., E.G.M.; (Dec. 10, 1940) B. V. Draper, D.F.C.

Act. P/O. on probation T. S. Kilpatrick is graded as Pilot Officer on probation Aug. 24, 1940, and confirmed in his appointment (Dec. 11, 1940).

The undermentioned Acting Pilot Officers on probation are graded as Pilot Officers on probation:—(July 27, 1940) J. P. Davis, R. E. Tongue; (Aug. 17, 1940) J. H. Hoare-Scott, D. M. Ryan; (Sept. 7, 1940) J. J. Nottridge.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(Dec. 3, 1940) J. N. Glass; (Dec. 8, 1940) D. W. Donaldson; (Dec. 16, 1940) J. W. Franklin, H. G. Goddard, H. F. Morley.

P/O. N. S. Lacey is promoted to the rank of Flying Officer (Sept. 10, 1940).

F/O. M. W. Anderson is transferred to the Technical Branch (Nov. 24, 1940).

P/O. on probation R. N. Wyse is transferred to the Administrative and Special Duties Branch (Dec. 19, 1940)

F/O. P. J. Crummey (84655) is dismissed the Service by sentence of General Court Martial (Dec. 9, 1940).

Technical Branch.

Sgt. F. S. Adams is granted a commission for the duration of hostilities as Pilot Officer on probation (Dec. 6, 1940, Sen. Oct. 31, 1940).

Balloon Branch.

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—Sergeants: (Dec. 10, 1940, Sen. Nov. 25, 1940) J. E. Herridge; (Dec. 11, 1940, Sen. Nov. 25, 1940) A. W. Smith. Corporals: (Dec. 8, 1940, Sen. Nov. 22, 1940) L. Downey; (Dec. 10, 1940, Sen. Nov. 25, 1940) A. F. H. Pountney. Leading Aircraftman: (Dec. 10, 1940, Sen. Nov. 25, 1940) R. H. L. Oakes. Aircraftsmen 1st Class: (Sept. 16, 1940, Sen. Sept. 5, 1940) A. H. James; (Dec. 10, 1940, Sen. Nov. 25, 1940) C. H. Salmon.

The undermentioned Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer:—(Oct. 5, 1940) E. Shaw; (Nov. 7, 1940) C. A. White; (Dec. 7, 1940) S. E. Banks.

Administrative and Special Duties Branch.

The undermentioned are granted commissions for the duration of hostilities:—As Flying Officer on probation:—Warrant Officer: (Sept. 9, 1940, Sen. Aug. 20, 1940) E. Ramsden. As Pilot Officers on probation:—(Nov. 26, 1939) B. W. Kirby (substituted for notification of Dec. 19, 1939); (Feb. 29, 1940) A. E. Dennis (substituted for notification of Mar. 19, 1940); (June 24, 1940) B. M. Newton (substituted for notification of Nov. 5, 1940); (June 27, 1940) R. F. Gwyn (substituted for notification of Oct. 22, 1940); (July 1, 1940) T. C. Orgill, C.I.E.; (July 8, 1940) H. G. Shrubb; (July 15, 1940) R. I. Fowler; (July 18, 1940) E. B. Manson; (Aug. 11, 1940) C. P. Primrose, D.F.C.; (Oct. 2, 1940) A. J. W. Sanson; (Oct. 8, 1940) P. J. Coles; (Oct. 13, 1940) P. R. Dawson; (Oct. 18, 1940) S. Cromarty-Dickson; (Oct. 23, 1940) C. E. Badley; (Oct. 25, 1940) J. W. Webb; (Nov. 4, 1940) A. G. Baird; (Nov. 7, 1940) E. C. East; (Nov. 9, 1940) H. E. D. Gutteridge; (Nov. 11, 1940) W. G. J. Pearce; (Nov. 12, 1940) F. D. Maclean; (Nov. 15, 1940) C. J. Syred; (Nov. 21, 1940) R. H. Macdonald, T. H. C. Wardlaw; (Nov. 22, 1940) F. L. Ashley, J. D. Atkinson, A.F.C., A. Bartle, F. B. Blinkhorn, R. G. Burnett, L. H. Button, W. E. B. Clark, J. Cohen, A. D. Crone, R. Cumming, F. A. Deen, D. F. Denton, D. C. Dolman, L. D. Fawcett, R. E. Fenton, C. E. Fisher, R. L. Ford, F. R. Fowler, A. Gardner, A. T. Genton, S. P. Grounds, A. L. Houghton, J. L. Keith, J. de R. Kent, D. H. O'H. Kinnard, J. L. Law, W. E. E. Macartney, G. W. MacDougall, E. J. Marx, R. C. Morgan, A. W. Motion, R. C. Noel-Johnson, F. C. Pegg, P. H. C. Pinnock, E. A. Price, F. D. Robinson, A. C. Rogers, R. Ruck, W. Rule, M. C. Tebbitt, L. H. Turner, T. B. L. Webb, P. G. Weston, W. H. Youdale, J. K. Young; (Nov. 23, 1940) E. A. Marchant; (Nov. 29, 1940) R. Fearon; (Nov. 30, 1940) J. Kyle-Price; (Dec. 4, 1940) M. Clapham; (Dec. 5, 1940) A. T. Crighton, B. L. Middleton; (Dec. 7, 1940) T. E. Winslow; (Dec. 16, 1940) R. L. Butchers, F. H. Carrington, J. Doyle, S. E. Golding, W. F. Hawkins, W. A. Hodgkiss, V. Millson, E. H. Richards, F. Robinson, A. E. Stephens, J. Stickells, G. L. I. Tarrant, J. G. Williams, E. A. Wood.

The undermentioned officers of the Southern Rhodesian Air Force are granted commissions for the duration of hostilities:—As Flying Officer:—Flying Officer: (Nov. 18, 1940) I. Walters. As Pilot Officers on probation:—Flying Officer: (Apr. 1, 1940, Sen. Feb. 19, 1940) P. H. C. Theodosiou. Pilot Officer: (Sept. 4, 1940) C. R. Messitertooze.

The undermentioned are granted honorary commissions (Dec. 17, 1940):—As Squadron Leader: H. T. Roberts. As Flight Lieutenant: W. J. M. Wells.

The undermentioned Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer:—(Sept. 19, 1940) E. Marler; (Sept. 26, 1940) J. F. Blick, S. H. Coventry; (Sept. 28, 1940) F. J. Greenacre; (Oct. 10, 1940) G. Higginbottom; (Oct. 20, 1940) J. C. Allan; (Nov. 14, 1940) E. G. Dineen, W. G. Rayne; (Nov. 17, 1940) R. C. W. H. Le Fleming; (Nov. 19, 1940) E. R. Jones-Humphreys, A. May; (Nov. 20, 1940) C. L. Leven.

Flt. Lt. E. K. Price is transferred to the General Duties Branch (Oct. 14, 1940).

The undermentioned are transferred to the Technical Branch:—Flight Lieutenant: (Apr. 24, 1940) H. Gott. Flying Officer: (Apr. 24, 1940) W. C. Vaughan. Pilot Officers on probation: (July 9, 1940) R. W. H. Bloxam; (Aug. 15, 1940) G. E. Buckley; (Oct. 2, 1940) E. R. Crowther, P. C. Gardiner.

P/O. A. W. Simon relinquishes the acting rank of Flight Lieutenant (Apr. 29, 1940).

P/O. (on probation) J. J. S. Ellis relinquishes his commission on account of ill-health (Dec. 30, 1940).

Erratum.

In notification of Nov. 5, 1940, concerning F/O. E. D. Drew. *For* Sept. 3, 1940, *read* Apr. 24, 1940).

Meteorological Branch.

H. N. Winwood is granted a commission for the duration of hostilities as Act. Pilot Officer on probation (Dec. 20, 1940).

The undermentioned Pilot Officers on probation are confirmed in their appointments Aug. 1, 1940, and promoted to the rank of Flying Officer:—(Nov. 20, 1940) J. A. Caldecott, L. H. Shave; (Nov. 21, 1940) A. J. Compton, L. G. Hall; (Nov. 22, 1940) E. J. Wenham; (Nov. 23, 1940) L. W. Carroll, H. G. Robinson; (Nov. 24, 1940) P. D. Bailey; (Nov. 27, 1940) T. F. Davis.

Equipment Branch.

P/O. A. E. Stringer, Southern Rhodesian Air Force, is granted a commission for the duration of hostilities as Pilot Officer on probation (Apr. 1, 1940, Sen. Nov. 6, 1939).

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—(Oct. 3, 1940) A. E. Hedges; (Oct. 8, 1940) H. G. Bennett.

Act. P/O. on probation N. R. Melville is confirmed in his appointment Jan. 19, 1939, and graded as Pilot Officer July 19, 1939.

The undermentioned Act. Pilot Officers on probation are graded as Pilot Officers on probation (Sept 27, 1940):—D. K. Atkinson, J. E. Christie, F. R. Cobb, G. Cockshut, R. D. Culverwell, D. L. Kavanagh, R. M. Lemonius, G. C. H. Longland, F. W. Marlow, R. L. Melville, J. M. Parker, W. R. B. Reed, R. S. B. Tucker, E. A. Wollaston.

P/O. J. P. Orford is transferred to the Administrative and Special Duties Branch (Dec. 21, 1940).

Accountant Branch.

The undermentioned officers of the Southern Rhodesian Air Force are granted commissions for the duration of hostilities as Pilot Officers on probation:—Pilot Officers: (April 1, 1940, Sen. Nov. 6, 1939) H. A. O. Wootton; (Sept. 1, 1940) J. A. Alexander.

Act. Pilot Officer on probation N. W. Harper is graded as Pilot Officer on probation (Aug. 19, 1940).

Flt. Lt (temp. Sqn. Ldr.) D. C. Aherne resigns his commission (Dec. 1, 1940).

Medical Branch.

The undermentioned are granted commissions for the duration of hostilities (Dec. 6, 1940):—As Squadron Leader: I. J. Davies, M.D., B.Ch., D.P.M. As Flight Lieutenant: H. A. D. Small, M.B., Ch.B., F.R.C.S. As Flying Officers: C. M. Chambers, L.R.C.P. & S., L.R.F.P.S.; T. O. Corson, M.B., Ch.B.; D. J. Dawson, M.B., Ch.B.; W. R. Dyke, L.M.S.S.A.; D. G. Evans, M.B., B.Ch.; S. Gnessen, M.R.C.S., L.R.C.P.; J. Phillips, M.R.C.S., L.R.C.P.; E. Robinson, M.B., Ch.B.; J. Rubie, M.B., B.S., M.R.C.S., L.R.C.P.; R. N. Stansfield, M.R.C.S., L.R.C.P.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(Dec. 12, 1940) T. A. W. Edwards, M.B., B.Chir., M.R.C.S., L.R.C.P.; (Dec. 19, 1940) K. G. Bergin, M.B., B.Chir., M.R.C.S., L.R.C.P., M.A.; C. R. Hamand, L.R.C.P. & S., L.R.F.P.S.; D. Stafford-Clark, M.B., B.S., M.R.C.S., L.R.C.P.

Dental Branch.

The undermentioned are granted commissions for the duration of hostilities as Flying Officers:—(Dec. 6, 1940) G. W. Aaronson, L.D.S., G. Calvert, L.D.S., F. A. Edgar, L.D.S., G. Fleming, L.D.S., J. H. Flitcroft, L.D.S., F. Grossman, L.D.S., W. C. Hodge, L.D.S., I. Lipington, L.D.S., I. W. Ross, L.D.S., W. J. Smith, L.D.S.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(Nov. 28, 1940) G. H. Burton, L.D.S., V. R. Roberts, L.D.S., R. J. Smith, L.D.S.

Chaplains' Branch.

The undermentioned are granted commissions for the duration of hostilities with the relative rank of Squadron Leader:—(Dec. 10, 1940) the Rev. H. J. W. Carpenter, B.Litt., the Rev. D. T. Evans, B.A.; (Dec. 12, 1940) the Rev. R. E. A. Ankers; (Dec. 17, 1940) the Rev. R. Elphick, the Rev. E. P. St. John.

Auxiliary Air Force

General Duties Branch.

P/O. G. F. H. Webb is promoted to the rank of Flying Officer on 3rd Sept., 1940.

Balloon Branch.

The undermentioned Pilot Officers are promoted to the rank of Flying Officer:—(Sept. 3, 1940) R. C. Hawkins; (Oct. 17, 1940) J. W. Chapman; (Nov. 1, 1940) G. Richmond, T. L. Vickers; (Nov. 2, 1940) A. Hollinghurst; (Nov. 3, 1940) R. S. C. Racker.

Sqn. Ldr. A. E. Knight relinquishes his commission on account of ill-health (Dec. 28, 1940).

Women's Auxiliary Air Force

The undermentioned are appointed Assistant Section Officers:—(Dec. 18, 1940) A/CW.1 Miss E. M. Beddie, Sgt. Mrs. M. W. Buckton, A/CW.1 Miss M. Crawford, A/CW.2 Mrs. B. W. George, Cpl. Miss F. B. Hill, A/CW.1 Mrs. M. F. Lancaster, A/CW.2 Mrs. H. L. Manning, A/CW.2 Miss V. R. C. Murch, A/CW.2 Mrs. A. C. Remington, A/CW.1 Miss A. B. Walker, A/CW.2 Miss H. B. Whitmore, A/CW.2 Miss M. A. Wibberley; (Dec. 21, 1940) A/CW.1 Miss P. M. Bailey, A/CW.2 Miss A. M. V. Dawson, A/CW.2 Miss B. J. Gordon-Smith, A/CW.1 Miss J. K. Greig, A/CW.2 Miss N. M. Lovell, A/CW.2 Miss J. MacCalman, A/CW.1 Miss J. E. M. Prall, A/CW.1 Miss L. M. Prall, A/CW.2 Miss M. R. Roberts, A/CW.1 Miss R. M. Sydney-Smith, A/CW.2 Miss G. R. Thornton.

The undermentioned relinquish their appointments:—Section Officer: (Nov. 20, 1940) Mrs. F. M. Greenfield. Assistant Section Officers: (Dec. 7, 1940) Mrs. E. H. G. Haslam; (Dec. 12, 1940) Lady J. E. Rhys-Williams, D.B.E.; (Dec. 15, 1940) Mrs. J. Poyser.